Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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Commercial Fisheries Abstracts

Prepared in the Division of Industrial Research and Services Bureau of Commercial Fisheries

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Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

0 General and theoretical	3 Preserved fish	7 Analytical Methods
1 Fish by species	4 Oils	8 Composition
2 Fresh fish	5 Vitamins	9 Miscellaneous
	6 Fishery byproducts	

Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.5 BACTERIOLOGY

Anonymous
Report of the Food Investigation Board (Great Britain) for 1956, pp. 22-23 (1957)

Luminous bacteria.--More than 30 species of fish from areas along the coast of the British Isles have been examined for luminous bacteria. This study is part of a larger study to gain information about the distribution and classification of luminous bacteria, which form a large part of the flora of fish. Most of the 30 species of fish examined contained luminous bacteria in their intestinal tract even when caught at different times of the year. These luminous bacteria frequently represent a large portion of the intestinal flora. Usually, only two types of luminous bacteria are present. The majority of the strains of Photobacterium phosphorescens isolated from the sea around the British Isles were sensitive to marine bacteriophage, whereas none of a few strains similar to, but not identical with, Photobacterium phosphorescens and isolated from the sea around Japan were sensitive to marine bacteriophage. Also included in this study, are the effects of the storage of bacterial cultures and bacteriophage filtrates upon the sensitivity of bacterial cultures to bacteriophage.

Microbiology of salt used in smoke curing.--The majority of organisms found in salts and salt brines are (1) gram positive and (2) Micrococci. The remaining minority consist of Coryneform and spore forming bacilli. Salt for curing usually has a total bacteria count of about 10^2 per gram. Brines made by the fish trade have total bacteria counts of 10^4 per ml. The bacteria counts of these brines increase continuously as more and more fish are passed through the brine tank. After 6 hours of continuous use, during which time 100 to 200 stones of fish may have been brined, the bacteria count reaches a level of about 10^7 per ml.

Differentiation of Pseudomonadaceae and allied groups.--Six distinct genera may be recognized unequivocally and fairly rapidly by the use of criteria such as their sensitivity to antibiotics, their

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 ABSTRACTER: Martin Heerdt

2.1123 THE WORLD'S LINE FISHERIES

Alverson, D. L.
Pacific Fisherman 56, 40-41 (April 1958)

Hook and line fishing is one of the oldest known methods of capturing fish. The antiquity of the method, however, has not outmoded its use. A large proportion of the world's fish catch still is produced by line fishermen. Hook and line fisheries exist in fresh water rivers and lakes as well as in all the major oceans and seas of the world. Line gear is fished from the shore, from small craft, and from ocean-going pelagic vessels. The number of men involved in the line fisheries probably exceeds the number involved in any other method of capturing fish.

Two promising recent developments in line fishing have resulted from experiments carried out by Japanese technologists and by the staff of the United States Pacific Oceanic Fisheries Investigations.

Synthetic bait.--The Japanese for some time have been seeking an artificial bait to supply long-line fisheries operating in equatorial waters far from their home ports. The use of an artificial bait would reduce the cost of operation and eliminate the manpower needed to preserve, transport, and store the fresh bait that is now used.

An artificial squid made of latex sponge rubber was designed by T. Kayama of Tokyo. Its smell, taste, and texture are similar to those of the actual bait. Painted with micaceous powder to give it an opaque, shimmering lustre, the lure is 35 centimeters in length and weighs 103 grams. The squid-like odor is obtained by soaking the bait in a saponified solution of squid oil.

An evaluation of a number of tests designed to compare the effectiveness of artificial squid with true squid indicated that the artificial product was about 60 percent as effective as the real thing. This indicates that there is a definite possibility of developing an artificial bait that successfully can catch fish.

"Tub method" long-line hauler.--The line hauler for tuna long-line gear was developed in Japan in 1925. It since has been adopted for line fisheries in Brazil, Hawaii, and the United States. Even

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 ABSTRACTER: Kathryn L. Osterhaug

2.111 SYNTHETIC FIBERS IN THE WORLD'S FISHERIES

Alverson, D. L.
Pacific Fisherman 56, 39 (March 1958)

The large number of papers presented at the Hamburg Gear Congress relevant to net fibers gave evidence of a strong trend towards the use of synthetic fibers in fish nets, ropes, and some line fisheries.

Natural fibers.--Cotton, hemp, ramie, flax, sisal, manila, and jute still lead in volume of materials used for fish nets, but have one common fault--they are subject to rot. A number of preservatives have been developed to prolong net life. Acetylated cotton, which is extremely resistant to rot, is produced by treatment with acetic acid. Use of acetylated cotton has been restricted by the high cost of processing. The "Arigal" process, which deposits a synthetic resin in the cotton, is a simple and cheap process but relatively new.

The variety of synthetic fibers that are being marketed, as well as the host of brand names, has complicated and confused the terminology of synthetic fibers.

Polyamides.--Nylon, perlon, and rilsan are the main polyamides used in the fishing industry. Other polyamides being produced include eftrelon, enkalon, furon, phrixperlon, raylon, silon, steelon, supron, trelon, and wetrelon. Nylenka, caprolon, grilon, amilon, and neplon are all synonymous for nylon. Polyamides generally have good tensile strength, high abrasion resistance, and rot and mildew resistance but are sensitive to sunlight. Both nylon and perlon have a specific gravity of 1.14 while rilsan is 1.04.

Polyesters.--Dacron tergal, terylene, diolene, and trevira are polyester fibers with a specific

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 ABSTRACTER: Richard L. McNeely

2.116 JAPANESE FISH-FINDER

Anonymous
Fisheries Newsletter (Australia) 17, 13 (April 1958)

A new Japanese fish-finder, developed by the Agriculture and Forestry Ministry's Fishery Agency, can locate such fish as sea bream, croaker, sharp-toothed eel, flatfish, and king crab. Although based on the principle of echo-sounders, the fish-finder is technically more involved. It is capable not only of gauging the depth of the ocean, but also of locating even a single fish 300 to 600 feet below the surface.

The new fish-finder utilizes ultrasonic waves as high as 200,000 frequencies (200 k.c.), which sharpen the discrimination between the sea bottom and groundfish. Moreover, this high frequency lessens the attenuation of the sound waves resulting from air bubbles in the water created by a ship in motion, or when the sea is stormy.

This equipment has enabled Japanese researchers to locate many groundfish and king crabs, even during turbulent weather (says Fishery Products Report).

Modern electronics is playing an increasingly important role in the Japanese fishing industry, with such scientific aids as direction finders, radar, ultra shortwave equipment, echo-sounder, sonar, and fish-finders. Twenty percent, or approximately 7,500, of Japanese fishing boats of over five tons are equipped with fish-finders.

The Fishery Agency has recently been engaged in research on a fish-finder for tuna. Tuna are difficult to locate because of their speed and the dispersal of tuna schools.

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IDENTIFICATION OF MARINE BACTERIA

SYNTHETICS FOR GEAR

GEAR DEVELOPMENT

JAPANESE FISH-FINDER

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gravity of 1.38, high breaking strength, resistance to sunlight, good mesh size retention, and low moisture absorption.

Polyacrylonitrile. --Orlon is the best known polyacrylonitrile. Dolan, pan, dralon, redon, creslon (x-54), darlan, crylor, colon, fiber D, nitrilon, N. 53, and wolcrylon are other synthetics in this group. They are resistant to shrinkage, sunlight, and mildew. They do not have the high breaking strength of either nylon or dacron. These fibers have a specific gravity of 1.17.

Polyvinylalcohol.--Venylon, kanebion, kuralon, newlon, and woolon are made in Japan. Cremona and synthofil are European polyvinylalcohol fibers. They are low priced, have good weather resistance, but lose strength after prolonged exposure to sunlight. They have a specific gravity of 1.39 and a high moisture absorption characteristic. Polyvinylalcohol fibers are not as strong as either polyesters or polyamides.

Polyethylene. -- Trade names in this group include polyethylene, firestone reevon, avisco, curlene, and northlene. They have a specific gravity of .93 and are in demand for floating ropes, lifelines, and light weight twines for nets. These fibers have practically no water absorption and a comparatively low tensile strength that is reduced after exposure to sunlight.

Polyvinylidene chloride. -- Saran and kurehalon (Kura halon and Krehalon) are well know in the fishing industry. Other fibers in this group are less known and include dynel, harlon, viston, tygon, hexon, velon, mill's plastic, and permalon. They have a specific gravity of 1.70 and relative low water absorption.

Polyvinylchloride. --Fibers in this group include teviron, envilon, rhovyl, P.C.V., vinyon, bristrand, rhofil, fibrovyl, isovyl, movel, P.E.C.E., rhofibre, chlorin, and thermovyl. These fibers have a specific gravity of 1.39, medium strength, good abrasion resistance, and are unaffected by sunlight.

Blended fibers. -- There are a number of blend products which produce a twine with characteristics intermediate between the original fibers.

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mode of breakdown of carbohydrates, their motility, and their type of flagella. This scheme varies (1) from that of Bergy (Sixth Edition) because Vibrios are placed in tribe one (Pseudomonadaceae) and (2) from that of Brisou and Prevot because many of the nonpigmented polar flagellated, asporogenous, gram negative rods are classified as Achromobacter spp. The scheme has been fully tested at Torry with 3,000 fresh isolates from fish and marine sources and over 160 named strains of Pseudomonas, Xanthomonas, Aermonas, Vibrio, Spirillum, Falvobacterium, and Achromobacter, from all types of environment.

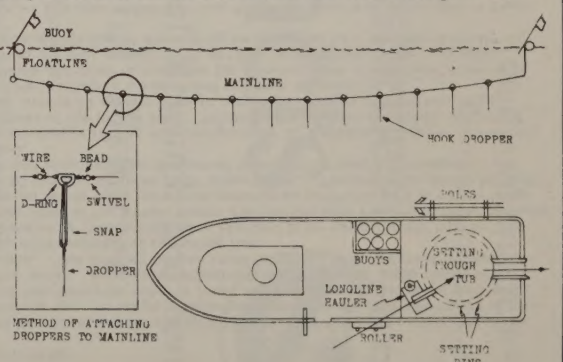
Type culture collection of marine bacteria. -- Because considerable confusion exists with regard to identifying marine bacteria, results as reported cannot be relied upon unless it is possible to know what organisms have been referred to. The need for maintaining a collection of bacteria for comparative purposes is thus emphasized. Torry Research Station maintains a type culture collection of marine bacteria that is becoming increasingly known throughout the world.

2.1123 (Cross Reference: 2.1127)

with the line hauler, however, the Japanese method of pelagic tuna fishing requires too much manpower to be suitable for use by American fishermen. The "tub method" developed by the Pacific Oceanic Fisheries Investigation group is the most successful method to date of increasing the efficiency of pelagic line fisheries.

Fewer men are required to handle the gear when the tub method is used. The unique feature of the tub technique is the continuous main line that is set from one large tub instead of from numerous baskets that must be separated and joined together for each day's fishing. The droppers or gangions are detachable from the main line and are removed as the gear is hauled. From 60 to 100 baskets are united by the use of a clover-leaf knot and fished during a days set. The droppers are spaced 15 fathoms apart.

Prior to sailing, baskets of main line are knotted together with the clover-leaf and fed into the tub with the use of a Japanese line hauler. Baiting takes place just prior to setting.



POF1 Long-line Method of high seas tuna fishing is shown in this schematic sketch.

2.118 TORRY RESEARCH STATION

Anonymous
Chemistry and Industry No. 12, p. D (March 22, 1958)

Transportation of fish.--A major problem in Great Britain is how to get fish from the sea to the table either fresh, frozen, smoked, or canned in an appetizing condition throughout the year. Difficulties in the distribution of fish are caused by (1) high perishability for which marine bacteria are chiefly responsible; (2) a large time lag between catching and consumption; (3) seasonal or short-term fluctuations in fish; and (4) unsatisfactory storage conditions. Over half of the "white" fish catch of about 800,000 tons comes from Arctic waters on a 3-week round trip schedule.

Icing.--Stowage in crushed ice is used to preserve most of the catch at sea and subsequently on land; but the capacity of this method for keeping fish in acceptable condition is frequently exceeded in practice. Much effort, therefore, has been made at Torry Research Station in Aberdeen, Scotland, and at the Humber Laboratory in Hull, England, to define limits of fish freshness and to evaluate possible improvements. A system of assessing freshness by a trained panel has been operated successfully for ten years. With this yardstick of quality, the Torry Station staff determined that even with care and clean handling well-iced cod and haddock cannot be kept reasonably fresh for more than 10 to 11 days; and that the limit of edibility is reached at about 15 days. The root problem of the distant-water fisheries now can be more precisely appreciated. The last-caught fish aboard a trawler often have been not less than five days in ice at landing, whereas the first-caught fish often have been 15 days or more in ice at landing. About 0.5 percent of the annual catch is condemned as unfit for food at the port, and a considerably larger percentage of the annual catch is condemned at inland markets.

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 ABSTRACTER: Martin Heerdt

2.9 CHEMICALS IN FOODS

Schultz, H. W. (Department of Food and Dairy Technology, Oregon State College, Corvallis)
Journal of the American Dietetic Association 34, 492-495 (May 1958)

What are chemicals in foods?--The word "chemical" associated with foods to many people seems to connote undesirability or harmfulness. They do not realize that foods themselves are chemicals or combinations of chemical substances. Frequently the chemicals added to foods--for example, vitamins and some minerals, flavors, and coloring materials--are natural components of foods that have been eaten for centuries.

The chemicals that occur in foods as a result of application in the production of food crops; in the processing, preserving, and storing of foodstuffs; and in the packaging of food materials are termed "chemical additives." "Intentional additives" are those that are added to preserve or improve the quality of the product. Those chemicals that serve no useful purpose in the final product and are present because they were used in the production, processing, or storage of the food are called "incidental additives."

Why are chemicals added to foods?--Two principal reasons why chemicals are used in foods are to preserve them and to improve the appeal or acceptability of the product. Methods of preservation include (1) drying, (2) smoking, (3) salting, (4) fermenting, (5) using chemicals, (6) concentrating, (7) heating, (8) cooling, (9) packaging, and (10) irradiating or cold sterilizing. Chemical additives may be used to improve the acceptability of products. Nutritional value, color, flavor, and texture have an important bearing on the acceptability of food, and in many instances, the desired effect can be brought about only through the use of additives. In other instances, the additive is used merely to facilitate processing or formulation to produce the desired product.

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 ABSTRACTER: June H. Olden

2.5 AIR SHIPMENT OF LOBSTERS

McLeese, D. W. (Biological Station of the Fisheries Research Board of Canada, St. Andrews, New Brunswick)
Trade News 10, 5-6 (March 1958)

The possibility that air shipment of live lobsters will become a practical method of transportation is approaching reality with the development of light-weight, leak-proof methods of packing.

The usual methods of packing lobster, which require the use of a considerable quantity of flake ice, are unsuitable for air transport because of excessive weight and leakage.

One Canadian paper company has designed a double-walled, corrugated, cardboard box with an aluminum foil covering for insulation. Depending upon the expected temperature during the holding period, up to 20 pounds of ice, sealed in a polyethylene bag, is used to keep the lobsters cool. For improved insulation, the box is sealed with tape. Two ½-inch air holes are necessary, however, to avoid suffocating the lobsters.

On October 29, 1957, a trial shipment of 250 pounds of lobsters was trucked from St. Andrews, N. B., to St. John, N. B., and then flown round trip to Montreal. During the 30 hours the lobsters were in transit, the temperature inside the boxes averaged 43° F. at an average air temperature of 47° F. Upon the completion of the return flight, over 95 percent of the lobsters were in excellent condition.

A new idea suggested by two Belgian lobster buyers is to pack the live lobsters in dry wood shavings. Dry wood shavings are placed in the bottom of a cardboard carton, and a layer of lobsters that

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 ABSTRACTER: Kathryn L. Osterhaug

3.2382 FROZEN FISH PACKAGING PROBLEMS

Cage, James K.
Quick Frozen Foods 20, 134-135, 145 (April 1958)

Characteristics of a good frozen-food packaging material include the following: (1) moisture-vapor-proof, (2) nontoxic, (3) odorless and tasteless, (4) satisfactory and economical application on production equipment, (5) good strength at low temperatures, (6) leakproof for fluid materials, (7) unaffected by food product, and (8) sales attractiveness. Other needed characteristics depend upon the requirements of the specific product to be packaged.

Special packaging has been developed for a number of new fish and shellfish products.

Cook-in package.--A heat-sealable envelope container has been developed for freezing shrimp and later cooking it in the same package without first thawing it. The packaging material had to be able to withstand both freezing and boiling temperatures. The material used is an aluminum foil-paper polyethylene combination. A special ink formulation that could withstand the varying conditions of freezing and boiling water was developed specifically for this product.

Frozen lobster.--The special requirements desired in a packaging material for frozen lobster were that it be a heat-sealable envelope that could be used for gas, vacuum, or atmospheric packaging and that the frozen storage life of the product be at least 4 to 6 months.

Two problems encountered with the lobsters were (1) the numerous sharp spines and protrusions that punctured even the strongest materials and (2) the difficulty in maintaining the lobster meat in satisfactory condition for the required length of time. The problem of packaging was finally resolved

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 ABSTRACTER: Kathryn L. Osterhaug

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have been allowed to drain for 15 minutes is packed on top of the shavings. Additional dry shavings are added to cover the lobsters, and the process is repeated to fill the box. As a demonstration, three boxes were filled in this manner, each box containing 50 pounds of lobster and 5 pounds of shavings. The boxes were not iced but were kept at a cool room temperature of 50° F. After two days of storage, the 150 pounds of lobster was in surprisingly good condition and showed no signs of weakening.

An experiment to find out how long lobsters could be expected to live in wood shavings at different temperatures was done at St. Andrews, N. B. The uniced boxes of lobster were stored at various temperatures. The initial temperature inside each box was 50° F. To see if survival could be prolonged by icing, 5 pounds of ice sealed in a plastic bag was placed in each of four boxes held at 70° F. The results of these tests are given in a table.

The tests demonstrated that lobsters packed in wood shavings will remain in vigorous condition for reasonably long periods (up to 6 days) if they are stored at low temperature.

SAFE HOLDING TIME FOR LOBSTERS AT VARIOUS TEMPERATURES

Holding Temperature	Treatment	No. of Lobsters Tested	Safe Holding Time
70°F.	Wood shavings	20	Less than 1 day
45°F.	Wood shavings	60	4 days
35°F.	Wood shavings	40	6 days
70°F.	Wood shavings plus 5 pounds of ice per box	80	Less than 2 days
35°F.	Without shavings	20	5 days

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Following prewar research, postwar surveys, and experiments by the Torry staff on distant-water trawlers, a bulletin entitled, "The Care of the Trawler's Fish," was published (H. M. S. O., 1953). This bulletin explains the main principles of good practice, stresses the over-riding importance of speedy and effective chilling as well as the significant contribution of care and cleanliness in handling and stowage, and indicates that catches could on the average be several days fresher at landing from voyages of the usual length if all the principles outlined were fully observed. New ships now under construction have better insulated holds that are frequently lined and shelved with metal, are more easily cleaned, and are more durable than wood.

Freezing and cold storage. -- To preserve the distant-water trawler's catch more effectively and to satisfactorily store seasonal and other gluts of fish including herring, if necessary for a period of months, the Torry Station recommends proper freezing and cold storage facilities. Research has shown that this primarily means quick-freezing and storage at -10° to -20° F. Cold storage rooms for holding frozen fish at 0° F. and -10° F. are proving to be a major factor in "living down" the poor reputation formerly earned by frozen fish when it was stored at 10° to 20° F. First-class frozen products require really fresh raw material.

Freezing aboard the trawler. -- Recently Torry scientists and engineers, at the request of the trawler owners and the White Fish Authority, planned and supervised full-scale trials for freezing the first part of the catch taken aboard a large distant-water trawler. Special compact, high-capacity, labor-saving, quick-freezers were used, the prototype of which was designed at the Station.

These trials, an account of which is contained in "Report on an Experiment into the Freezing of Fish at Sea" (White Fish Authority, 1957), clearly proved the technical feasibility and the excellent quality of trawler frozen cod and haddock. The way is now open for a major improvement in the average quality of trawler catches. Designs for new trawlers of conventional size that take advantage of refrigeration should make possible a relatively longer period of fishing on each voyage.

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by inserting a sleeve of corrugated board inside the envelopes to pad the spines and protrusions.

The storage time of the frozen lobsters was prolonged by blanching them in boiling water for from four to eight minutes.

The outer heat-sealable envelopes used for packing the lobsters in gas or in vacuum consisted of .00025-inch Mylar, .00065-inch aluminum foil, and .00075-inch Saran and were gas impermeable. Atmospherically packaged lobster were placed in envelopes constructed of .00035-inch aluminum foil, 25-pound wet strength paper, and .001-inch polyethylene.

Packed by any of the above methods, the lobsters had a storage life of at least 6 months.

Freeze-dried lobster tails. -- South African lobster tails that had been dehydrated to a moisture content of less than 2 percent by a freeze-drying process were wrapped in .001-inch aluminum foil to prevent puncturing of the bags and then were packed in an atmosphere of nitrogen in bags composed of 30-pound bond paper, .0005-inch aluminum foil, and .0025-inch polyethylene. Stored at 100° F. in 80 to 85 percent relative humidity, the lobsters showed no deterioration during an 8-week test period.

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Sometimes chemical preservation can accomplish what other methods of preservation cannot; in many instances, the other methods fall short of producing the desired product. Usual methods, for example, might alter the natural food, whereas chemical treatment would not.

Many additives are used to produce physical characteristics, such as consistency or texture, that are not obtainable any other way. An important group of chemical additives includes the antioxidants, which prevent oxidative deterioration of foods and frequently protect their nutritive value and palatability. Still another important group includes the nutritional additives, such as vitamins and minerals. The esthetic appeal of foods may be improved by the use of flavoring agents and colors.

Public health considerations. -- Incidental additives, such as pesticides, might be introduced into foods during growth and processing and remain in the food in minute amounts. "There need be no hazard in the use of chemical additives if adequate scientific research programs are carried out prior to use."

In 1950, the Food Protection Committee was established by the National Research Council as a committee of the Food and Nutrition Board. This committee serves as a fact-finding and advisory body for government and industry in respect to the use of chemicals in foods. Current activities of the Food Protection Committee include study of possible ways of improving interpretation of toxicologic data, study of possible consequences from the use of chelating agents in foods, and intensified consideration of dietary carcinogenesis from the standpoint of the use of chemical additives in foods.

Summary. --In this brief presentation, an attempt was made to summarize the role of chemical additives in foods and to tell something about the function of the Food Protection Committee as a fact-finding agency to keep industry, public officials, and the public informed regarding the safety or hazard of chemical additives. A recent statement of the Food Protection Committee regarding the possible relationships between cancer and food additives was given. In conclusion, another statement by the Food Protection Committee seems appropriate: "Contrary to some ideas that have been circulated, reliable food processors have not reduced the nutritional quality of our foods or created inferior products through the use of chemical additives. Actually, the quality and sanitary characteristics of our foods have been improving. Likewise, there is no evidence that consumption of foods resulting from the use of the new chemicals in crop production or in the processing of foods has created mysterious disease epidemics or endangered the health of people."

3.2492 HUMIDITY AND ITS CONTROL

Sharpe, Norman (California State Polytechnic College, San Luis Obispo)
Industrial Refrigeration 134, 18-23 (March 1958)

Humidity is a broad general term referring to the concentration of moisture in the air. In dealing with refrigerated foods the problem of humidity control can be divided into two parts: (1) moisture given up by edibles within a refrigerated space and (2) moisture removed by the refrigerated surface.

Absolute humidity. -- Absolute humidity is defined as the weight of water vapor per unit volume of air.

Relative humidity. --Relative humidity is the ratio of the absolute humidity of the air to the absolute humidity in the air if it were saturated at the dry-bulb temperature.

If saturated air at any temperature were passed over a food product there would be no moisture evaporated from the food. If unsaturated air were continuously passed over the same food, evaporation would occur until saturation was reached.

Air velocity effect on produce moisture evaporation. -- Most fruits and vegetables are composed of more than 90 percent water. The protective skins keep them from dehydrating rapidly. Unfrozen fruits and vegetables give off moisture both by respiration and evaporation, forming a humidified layer of air next to the skin. In still air the removal of this moisture is primarily by diffusion, whereas with increased air velocity the process is mechanical and more rapid.

Glazing and packaging for retarding evaporation. --Ice glazing prevents dehydration but the glaze is

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ABSTRACTER: Richard W. Nelson

3.2493 FREEZING, COLD STORAGE OF HERRING, AND THAWING OF FISH

Anonymous
Report of the Food Investigation Board (Great Britain) for 1956, pp. 15-16 (1957)

Experimental. -- Herring frozen in a vertical plate freezer in the pilot plant at Torry Research Station during July and August of 1956 were stored at -7° F. and at -20° F. and assessed for quality after 3, 6, and 9 months of storage. The frozen herring were thawed, mechanically split, kippered, and graded. Peroxide values were determined on the fat of the thawed herring prior to kippering. The thawed herring also were cooked and tasted.

Results. --Thawed herring after 9 months storage at -7° F. had good flavor and were reasonably free from rancidity. Herring stored at -20° F. showed peroxide values that did not rise above 2 units, whereas herring stored at -7° F. showed peroxide values that did not rise above 3 units. On the basis of experience with small, less compact blocks of frozen fish, both of these values were very low for the long periods of storage involved. Herring caught in August were more firm initially and provided better kippers than herring caught during July. Herring caught during August and stored at -7° F. yielded 74 to 92 percent first class kippers, whereas those stored at -20° F. yielded 70 to 87 percent first class kippers, probably because the flesh became somewhat harder and tougher as a result of protein denaturation. Herring stored at -20° F. were brighter in appearance and made more first class kippers. Herring caught during July yielded only 51 to 58 percent first class kippers.

Discussion. -- These yields of first class kippers are not satisfactory for profitable production. The recent increase in the demand for boneless kippers and single kipper fillets, however, means that even torn herring can be used to produce marketable products such as boneless kippers and kipper fillets. The low yield of first class kippers appears to be due to factors other than the nature

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ABSTRACTER: Martin Heerdt

HUMIDITY IN COLD STORAGE

QUALITY OF FROZEN HERRING

3.2495 PROTEINS IN FISH MUSCLE. 11. ON THE EXTRACTION OF MYOSIN FROM COD MUSCLE WITH POTASSIUM IODIDE

Dingle, J. R. (Fisheries Research Board of Canada Technological Station, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 15, 135-153 (March 1958)

Deterioration in quality occurs during the frozen storage of lean fishes such as cod. This deterioration can be correlated with a loss in the solubility of fish protein actomyosin in salt solutions. Since it is not possible to study the behavior of these proteins in the muscle itself, they were extracted from cod protein and their nature was investigated.

Myosin is presumed to be one of the components of the potassium iodide extract of cod protein. In this study, KI extracts of cod muscle were compared with KCl extracts, which generally are known to contain actomyosin.

Extracts were prepared from portions of cod fillets (1) by extraction of the albumins with potassium phosphate buffer and (2) by extraction of the residue with KCl or KI. These extracts were used in electrophoretic, sedimentation, viscosity, and solubility studies.

One component appeared in the electrophoretic pattern of the KCl extract, whereas at least two components, one of which might be myosin and the other of which might be actin, appeared in the electrophoretic pattern of the KI extract. Similar electrophoretic patterns were obtained with the KI extracts of prerigor and postrigor cod muscle, whereas entirely different electrophoretic patterns were obtained with the KCl extracts.

The sedimentation patterns of the KI extracts and the KCl extracts of postrigor cod muscle

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ABSTRACTER: Herman S. Groninger

3.39 THE FORMATION OF MAGNESIUM-AMMONIUM-PHOSPHATE CRYSTALS IN CANNED SEA FOODS

Tanikawa, Eiichi; Nagasawa, Yoshio; and Sugiyama, Takashi (Faculty of Fisheries, Hokkaido University)
Bulletin of the Faculty of Fisheries, Hokkaido University 7, 247-251 (November 1956) (In English)

I. The conditions for the formation of crystals in canned sea foods. -- In a canned product containing magnesium, ammonium, and phosphate ions, precipitation of struvite crystals ($MgNH_4PO_4 \cdot 6H_2O$) will continue until equilibrium is reached between the precipitate and the concentration of the solution of the constituent ions.

II. Solubility of struvite formed in canned sea foods and $MgNH_4PO_4 \cdot 6H_2O$ crystals synthesized in laboratory. -- Ibid. 7, 300-305 (February 1957). The solubility of crystals of struvite formed in canned crab and crystals of struvite prepared in the laboratory was greatest, respectively, at 65° C. and at 40° to 50° C. Below 50° C., needle-shaped crystals were formed with ease; whereas above 50° C., amorphous crystals were formed. Struvite crystals were easiest to grow in the decreasing temperature range 30° to 20° C. Crystal solubility decreased as the pH value of the solution increased above pH 4.0.

III. The crystallizing state of chemically synthesized crystals at various temperatures. -- Ibid. 8, 59-64 (May 1957). To ascertain the temperature at which visible crystals of struvite are formed in commercially canned sea food products, the authors studied the size and shape of pure crystals obtained when solutions of the component ions were (a) combined at specific temperatures between 100° and 0° C. and left at that temperature or (b) combined at 100° to 98° C. and then cooled to specific temperatures between 70° and 10° C. Struvite crystals formed above 50° C. under condition (a) above

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ABSTRACTER: Martin Heerdt

CHEMISTRY OF FISH PROTEIN

STRUVITE IN CANNED SEA FOOD

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of the block freezing process. Attempts will be made to find the reasons for the poor yields.

Thawing of fish.--Practical solutions to the problems involved in commercial and domestic thawing of frozen fish are needed. Temperature control, through-put, and labor requirements were considered before thawing large quantities of frozen whole cod from the Northern Wave. Within limits, slow thawing through the critical range 23° to 32° F. does not appear to have the same effect upon quality as slow freezing. Rapid thawing appears to be desirable, but radiant heating, dielectric heating, and heating by passing an alternating current through the fish have been tried without success because all of these methods caused local over-heating. The thawing of small quantities of fillets in a range of sizes of packages is an entirely different problem.

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soon sublimed if the atmosphere is not kept at near saturation. Wrapping or packaging with materials nearly impervious to moisture provides a means of supplying a nearly saturated atmosphere around the product.

Moisture equilibrium between product evaporation and coil condensation.--Difference of absolute humidity between the absorbed air film on comestibles and the room air is a driving potential causing the evaporation of moisture. Difference in specific humidity between the air stream through the coil and the adsorbed air film on the coil surface is a driving potential causing the condensation of moisture. The quantity of moisture condensed must equal the quantity of moisture evaporated. For frozen foods the relative humidity should be kept high, but fresh fruits and vegetables are alive and breathe; hence the moisture from respiration must be removed.

Impractical to design for all-temperature stores.--In a cold-storage warehouse it is usually impractical to design separate rooms for each type of produce. Care must be taken if many types of items are stored in a single room. The optimum storage condition must be nearly the same for the items concerned. Most unfrozen produce has an optimum storage temperature between 30° and 32° F. and an optimum humidity between 80 and 90 percent.

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were amorphous, whereas those formed below 50° C. had regular facets, which showed the ability to polarize light. This difference is considered to be connected with the maximum solubility of the crystals at 50° C. Changes in the shape and size of the crystals under condition (b) above were influenced by the temperature and velocity of cooling. Visible crystals with regular facets were formed only when the temperature fell below 50° C. The crystals formed between 50° and 30° C. were larger than those formed at any other temperature. Since rapid cooling causes small crystals to form, a means may thus be found for reducing the size of crystals of magnesium-ammonium-phosphate in canned foods to the point of invisibility.

IV. Formation of the crystals of $MgNH_4PO_4 \cdot 6H_2O$ and its minimum ion concentration.-- Ibid. 8, 65-69 (May 1957) A study was made of the size and shape of crystals of struvite formed by mixing equal concentrations of magnesium-sulphate-ammonia solution and sodium phosphate (a) at various concentrations of solution in the range 0.0001 to 9.4 molar, (b) at various rates of mixing in the range 0 to 2 minutes, and (c) at atmospheric temperature and at 40° C. On mixing solutions of a concentration above 0.01 molar, visible crystals were formed. The minimum amount of magnesium needed in the mixed solution to yield visible crystals was 0.0122 percent. The more dilute the solution, the more regular was the shape of the crystal. Above 0.5 molar, crystal shape was irregular and clusters of needle-shaped crystals were formed. The crystals that formed when the solutions were mixed instantaneously were smaller and more irregular in shape than those that were formed within a 2-minute period of mixing.

V. The growth of the crystals of $MgNH_4PO_4 \cdot 6H_2O$ in glass vessel.--Ibid. 8, 69-73 (May 1957) Pure solutions of the component ions of magnesium-ammonium-phosphate were mixed in a glass vessel, and the size and shape of the crystals that formed were observed microscopically during storage. If the solutions were mixed rapidly, changes in the shape of the crystals were considerable; whereas if they had been mixed over a 2-minute period, no change occurred. In both situations, the size of the crystals increased with aging. The higher the concentration of the solutions, the smaller and more numerous were the crystals. These small crystals floated on the surface.

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showed respectively, 3 peaks and 4 peaks. Adenosine triphosphate (ATP) plus actomyosin from the KCl extract gave a sedimentation pattern qualitatively similar to that of the KI extract. Sedimentation patterns of the KCl extracts of prerigor and postrigor muscle were qualitatively similar to one another, whereas sedimentation patterns of the KI extracts of prerigor and postrigor muscle were qualitatively dissimilar.

KCl extracts of prerigor cod had a greater specific viscosity than KI extracts of prerigor cod. With aging, the viscosity of the KCl extracts decreased, whereas the viscosity of the KI extracts increased. The KI and KCl extracts showed the same viscosity whether obtained from prerigor or postrigor cod muscle. Actomyosin plus ATP had a viscosity behavior similar to the behavior of the KI extract.

The solubilities of cod protein obtained with a given type of extraction were identical whether derived from prerigor or postrigor muscle. The solubilities of the KCl extracts and KI extracts, however, differed characteristically from each other.

The sedimentation and the viscosity behavior of cod actomyosin in the presence of ATP resembled that of rabbit actomyosin under similar conditions. This resemblance suggests the existence of a cod myosin. Extraction of cod muscle with KI solutions appears to result in a dissociation of actomyosin. Myosin can be recovered in a somewhat altered form from the KI extract.

3.237 BREADING CONTRIBUTES TO THE MICROBIAL POPULATIONS OF FROZEN BREADED FISHERY PRODUCTS

Benarde, Melvin A. (University of Maryland, Crisfield)
Commercial Fisheries Review 20, 6-10 (March 1958)

From a bacteriological viewpoint, it is highly possible that commercially prepared fishery products may suffer from excessive handling, improper storage, and generally unsanitary conditions. Straka and Stokes (1956) have pointed out that "the dangers of excessive microbial contamination in precooked frozen foods are real." Thus a potential health hazard may be a distinct possibility.

For a crisp toast-like coating, breadings of various types are added to fishery products during processing. It has been suggested that these breadings may be a major contributor of bacterial contamination in precooked frozen fishery products. In order to test this suggestion, the investigators obtained breadings from three sources: (1) directly from the manufacturer, (2) at retail outlets, and (3) from processors of fish and shellfish products during the breading operation. These samples were subjected to a series of microbial examinations to discover the number and types of contaminating microflora.

Results and discussion. -- Counts were obtained from 10 manufacturer's samples (representing the 4 largest producers in the country), 7 retail samples, and 7 in-use samples. The manufacturer's samples ranged from 360 bacteria per gram for a bread crumb item to 4,500 per gram for a breading. The retail samples were likewise uniformly low; the highest was one breading containing 1,500 bacteria per gram. The in-use samples, on the other hand, contained many more bacteria than did those of either the manufacturer's samples or retail samples.

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ABSTRACTER: Kathryn L. Osterhaug

3.33 MAGNESIUM-AMMONIUM-PHOSPHATE CRYSTAL FORMATION IN CANNED LOBSTER

Hollett, Andrew (Atlantic Fisheries Experimental Station)
Journal of the Fisheries Research Board of Canada 6, No. 2, 183-193 (August 1953)

Analyses of canned lobster pickle have indicated that the concentration of inorganic phosphates ranged from 0.05 to 0.012 percent, that of ammonia nitrogen from 0.17 to over 0.4 percent, and that of magnesium from 0.010 to 0.033 percent. The variation in the magnesium concentration has been attributed to the use of sea water in one or more steps of the canning procedure.

The magnesium content of pickle from canned lobster in which no sea water had been used in the canning process ranged from 0.013 to 0.017 percent, with an average value of 0.015 percent.

The solubility of magnesium ammonium phosphate in canned lobster pickle was estimated to range from 0.10 to 0.12 percent.

It was established that there are adequate amounts of inorganic phosphate and ammonia in canned lobster for the formation of large quantities of magnesium-ammonium-phosphate crystals, but that the amounts formed are limited by the concentration of magnesium.

Experimental canning has shown that the formation of crystals in canned lobster can be almost completely eliminated if sea water is not used in any step of the canning procedure.

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Author's summary

3.5 SODIUM PHOSPHATE CRYSTALS ON SALT FISH

Dyer, W. J.; Fraser, Doris I.; and Dingle, J. R. (Fisheries Research Board of Canada, Halifax, Nova Scotia)
Nature 181, 858-859 (March 22, 1958)

Several samples of partly dried salt codfish were examined in an attempt to identify crystals found on the surface of the codfish. These crystals resembled neither sodium chloride nor calcium sulphate, both of which are often found on salt fish. One sample of salt codfish contained water-clear rhombic crystals with edges that were two centimeters or more in length. Other samples contained dry, powdery white crystals thickly scattered over the surface of the salt codfish.

Chemical analysis. -- Analysis showed that both types of crystals contained large amounts of phosphate and sodium, a small amount of chloride, and no sulphate, calcium, or magnesium. Clear rhombic crystals that were exposed to the dry air of the laboratory for one day changed into white powdery crystals similar to the dry powdery crystals described above. This powder contained 20 percent moisture and appeared to be the dihydrate of disodium hydrogen phosphate. Samples of these crystals that had been dried at 105° C. assayed 96.0 percent disodium hydrogen phosphate and 3 percent sodium chloride.

Findings. -- The clear rhombic crystals described above apparently were the dodecahydrate or the least soluble of the sodium phosphates, which in a dry atmosphere, lose water to form the dihydrate. The dihydrate contains 20.2 percent water and is a dry white powder or the second type of crystal found. The solubility of disodium hydrogen phosphate in a solution saturated with sodium chloride was not available; therefore, determinations of its solubility were made. At temperatures in the range 0.3 to 21.6° C., the average solubility range of Na_2HPO_4 and NaCl increased and

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ABSTRACTER: Martin Heerdt

3.6 DRYING

Anonymous
Report of the Food Investigation Board (Great Britain) for 1956, pp. 18-19 (1957)

Effect of fat content on moisture diffusion. -- In the equation $\gamma F = \gamma_o + kF$, γF is the "drying time-constant" for herring fillets with a fat content of F--γ_o and k are constants. The constant γ_o, which may be obtained by extrapolation, corresponds closely to the value to be expected for white-fish fillets of the same shape. This equation may be applied to the white flesh of herring. If the lateral brown band is included, consistent results are not obtained.

Evaporation. --The constant rate period of evaporation during the drying of herring fillets is considerably less than the same period during the drying of white fish. The duration of this period decreases with increasing fat content of the fillets. In theory, this behavior is a direct result of the effect of fat on the diffusion constant of water in the flesh. During the constant-rate period of drying, the rate of evaporation from the surfaces of fillets cut from all species of nonfatty fish examined was shown to be the same as the rate of evaporation from a free water surface.

Vacuum freeze-drying. -- In a small freeze-drier during the initial stages of drying, the apparent latent heat of evaporation of water from frozen cod flesh was in the range 620 to 710 B.t.u. per pound. This value agrees well with that obtained by Flosdorf for frozen solutions, but it is about 40 percent in excess of the theoretical value calculated from Clapeyron's equation. As drying nears completion, the apparent latent heat value exceeds 12,600 B.t.u. per pound.

Freeze-dried fish rehydrates very rapidly with most of the water being absorbed in the first few minutes by capillary action. Much of this capillary water can be removed by squeezing. Full rehydration of freeze-dried fish requires many hours and involves diffusion of the imbibed water into the flesh. The rate of rehydration does not appear to be related to the thickness of the fillets. Rehydrated, freeze-dried cod fillets are comparatively tasteless and odorless after being steamed in a

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ABSTRACTER: Martin Heerdt

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THEORY OF DEHYDRATION OF FISH

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casserole. At first the steamed fillets seem tender in texture; however, they rapidly become less tender as they are chewed, and the muscle fibers tend to lodge between the teeth. The texture and flavor of freeze-dried fillets, however, are still superior to the texture and flavor of other forms of dehydrated fish. Samples of freeze-dried fillets that were fried were found to be considerably more palatable than were those samples that were steamed.

Protein denaturation and the texture of dehydrated fish. -- Toughness developed in dehydrated fish during storage is believed to be caused by a chemical cross-linkage between the protein molecules. This hypothesis has been examined by comparing the solubility of dehydrated fish in salt solutions with the solubility of dehydrated fish in solutions of cross-linkage breaking compounds. Fresh fish show no difference in their solubility in these solutions. After fish have been dried, however, their solubility is considerably greater in solutions of cross-linkage breaking compounds than in salt solutions. Storage results in a decrease in solubility of dried fish in both types of solutions. The solubility of dehydrated fish in solutions of cross-linkage breaking compounds diminishes in the presence of reducing substances like thioglycolate, which reduces disulphide bonds. Disulphide bonds that have been reduced appear to be altered to less reactive forms such as a thioether.

Capitance resistance hygrometer. -- The mechanism of the capitance resistance hygrometer, which was first designed at Torry Research Station some years ago, is being investigated at the University of London. This study is concerned in particular with the causes of aging of the mechanism. This has been found to be due to a progressive increase in the pore-side resistance of the dielectric material at a given relative humidity.

3.237 (Cross Reference: 3.234)

In addition to higher total plate counts, the in-use samples had higher mold and yeast counts. The asporogenic pink and orange pigmented yeasts found were probably the ubiquitous Rhodotorula. The molds were predominantly Aspergillus and Penicillium. These yeasts and molds may have sanitary but little public health significance. The greater number of molds found in the in-use samples points up the normally moist condition present in the processing plant--which is favorable to growth of mold.

The coliform count, on the other hand, has a greater bearing on the general sanitary as well as health aspects of food processing. Three manufacturer's samples had gas-positive tubes. Further testing, however, indicated their nonfecal nature. They proved to be type II intermediates. This was also the case with the two retail samples.

Sample 1 of the in-use group contained a nonfecal contaminant, but samples 2 to 7 proved to be fecal types.

These findings coupled with visual inspection may allow the presumption that such contamination occurs from within the plant.

Summary and conclusions. --1. Samples of breadings from three sources were tested for bacterial density: (a) from the manufacturer directly, (b) from retail stores, and (c) from processing plants. 2. Breadings as received from the manufacturer do not appear to harbor large bacterial populations. 3. Indications are that breadings contribute bacterial contamination to precooked frozen fishery products after the breadings have been contaminated by the handlers during processing. 4. The precooking process destroys, to a great extent, the bacteria that contaminate the breading during processing. The tests on the microbial populations of the retail samples show these populations to be uniformly very low.

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and decreased, respectively, from 0.583 to 7.0 and from 35.31 to 33.43 grams per 100 grams of water.

Fishery salt contains only traces of phosphate, whereas fresh cod muscle was found to contain 0.2 percent total phosphorus of which 0.16 to 0.17 percent is inorganic phosphate. A moisture content of 81 percent in the fresh cod muscle would correspond with a concentration of 0.97 to 1.13 grams of anhydrous disodium phosphate per 100 grams of water. In undried salt fish this value remains unchanged because only dry salt is added during salting; and the concentration of phosphate in the water held by the fish should be the same as the concentration in the water lost by the fish, unless some phosphate is held by the tissue. Such a solution saturated with sodium chloride also would be saturated with disodium phosphate dodecahydrate at about 4° C. After partial drying, the temperature of saturation for the phosphate would increase. In one sample of slightly dried, heavy, salted fish, an analysis for moisture and phosphate indicated that the temperature of saturation would be about 11° C. Drying therefore favors the formation of disodium hydrogen phosphate crystals. Since most solar fishery salts are alkaline, any slight amount of spoilage--a common occurrence with medium salt fish--would raise the pH to 7.5 and permit crystals to form.

Conclusions. -- These findings explain the appearance of crystals on partially dried salt fish in cold storage or in transit during the winter months. Sodium phosphate also affects the solubility of sodium chloride. In the presence of sodium phosphate, the solubility of sodium chloride at 20° C. is only 93.9 percent of its normal value. This also explains why salt fish is rarely found in water that is completely saturated with sodium chloride.

4.11 A WEIGHING METHOD FOR MEASURING THE INDUCTION PERIOD OF MARINE AND OTHER OILS

Olcott, H. S. and Einset, E. (University of California, Berkeley)
Journal of the American Oil Chemists' Society 35, 161-162 (April 1958)

Introduction. --The rate of oxidation can be measured by weighing small samples of oils at intervals during storage. This method was found to be convenient for estimating the relative effectiveness of antioxidants in marine oils, other oils, and in purified fatty esters. A study, under contract with the U. S. Fish and Wildlife Service, was made to evaluate the advantages of a weighing technique.

Procedure. -- Accurately measure the desired amount of antioxidant into each of a series of 30-milliliter beakers. Weigh each beaker, and add to it 1.000 ± 0.003 grams of oil sample from a dropper. Reweigh each beaker, place the beakers in a constant temperature oven, and allow 10 to 20 minutes for the beakers to come up to temperature. Rotate the contents of each beaker to insure uniform distribution of antioxidant in the oil. Cover each beaker with a watch glass. Remove the beakers from the oven daily, allow 30 minutes for them to cool at room temperature, weigh each beaker to the nearest 0.1 milligram (mg.), and return it to the oven. Oven temperature and concentration of antioxidants were chosen so that the induction period would fall in the range 3 to 20 days and so that a ½-hour interruption for weighing daily would be of minor significance in measuring the length of the induction period.

Results. --Over a period of 3½ months, the induction period of a refined cottonseed oil held at 60° C. was 12, 11, 10.5, 11.5, 10.5, 10, 11, 10, and 10 days. The induction period of a menhaden oil that contained 0.05 percent 6-ethyl-2, 2, 4-trimethyl-1, 2-dihydroquinoline (EMQ) and was held at 60° C. was 8, 10.5, and 9 days. With 0.1 percent EMQ, the induction period for menhaden oil held at 50° C. was 24, 17.5, and 18 days. A 200 mg. sample of lard held at 60° C. gained 1.5, 1.7, 0.4, and 1.3 mg. in the first 24 hours and 3.3, 3.7, 1.0, and 3.6 mg. in the first 48 hours. The weighing

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ABSTRACTER: Martin Heerdt

4.21 BROWN-COLORED OXYPOLYMERS OF UNSATURATED FATS

Venolia, A. W. and Tappel, A. L. (University of California, Davis)
Journal of the American Oil Chemists' Society 35, 135-138 (March 1958)

Experimental. -- The formation of brown oxypolymers was studied in homogeneous emulsion systems consisting of 3 milliliters (ml.) of lipide and 10 ml. of an aqueous dispersion of protein. Menhaden and herring oils having saponification equivalents of 190 and 185 and iodine numbers of 187 and 138, respectively, were used. Fresh blood fibrin was prepared and powdered egg albumin was acetylated by the procedure of Fraenkel-Conrat.

The reflectance values of emulsions stored at constant temperatures in a water-saturated environment were measured on a tristimulus colorimeter successively through each of the three filters. From the readings, the total color difference, ΔE, was calculated. ΔE expresses the deviation of the color of an emulsion from its initial color.

Studies of active carbonyl-amino condensation during the initial oxidation of the menhaden oil-water emulsions were undertaken by adding phenylacetic acid or phenylanaline to the menhaden oil and then shaking the mixture in a Warburg vessel in a 50° C. bath. Unreacted phenylacetic acid or phenylalanine was determined spectrally. No significant differences between the amino acid and the control were found; consequently, there is an absence of active carbonyl-amine condensation reaction during the oxidation of menhaden oil.

Results. --Egg albumin emulsions were the most stable and formed a brown color most rapidly, whereas blood fibrin yielded the most unstable emulsions and formed a brown color very slowly. The behavior of the lactalbumin emulsions was intermediate in both respects. In each case the rate of formation of brown color between 20° and 55° C. was a function of an increase in pH. Emulsions of menhaden oil increased in browning-rate with each increase in temperature.

The introduction of various reagents into the menhaden oil emulsions resulted in different initial

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ABSTRACTER: Donald C. Malins

4.13 THE ORIGIN AND METABOLISM OF MARINE FATTY ACIDS: THE EFFECT OF DIET ON THE DEPOT FATS OF MUGIL CEPHALUS (THE COMMON MULLET)

Kelly, Peter B.; Reiser, Raymond; and Hood, Donald W. (The Agricultural and Mechanical College System of Texas)
Journal of the American Oil Chemists' Society 35, 189-192 (May 1958)

This study was made to investigate the origin of some typical marine fats by using the common mullet (Mugil cephalus) as a test animal. Mullet were used because of (1) their euryhaline habits and (2) their high viability in aquaria and on synthetic diets.

Experimental. -- Three groups of mullet were fed respectively, (1) a fat-free diet containing carbohydrate, protein, and all necessary known dietary supplements such as vitamins and minerals but not fat or fatty acids; (2) a marine diet composed of the fat-free diet above plus 10 percent emulsified menhaden oil; and (3) a fresh-water diet composed of the fat-free diet above plus 10 percent emulsified Wesson oil.

A representative sample of young mullet 3 to 6 inches in length was placed in each of three 45-gallon aquariums containing filtered, natural sea water with a salinity of 34 to 36 parts per thousand. Once daily each mullet specimen received one-fifth of an ounce of a finely divided food. The mullet in all three of the aquariums received the fat-free diet for 12 days. At the end of this period, mullet in aquarium A were continued on the fat-free diet, the mullet in aquarium B were placed on the simulated fresh-water diet, and the mullet in aquarium C were placed on the simulated marine diet. After 102 days on these diets the mullet were killed and analyzed for muscle and subcutaneous fat. Scaled and gutted mullet were cut into small pieces, covered with chloroform in a Waring Blendor, and agitated at top speed for 60 seconds. The slurry that resulted was vacuum filtered over anhydrous

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ABSTRACTER: Martin Heerdt

4.29 FISH-OIL RESEARCH AT THE SEATTLE FISHERY TECHNOLOGICAL LABORATORY

Hart, Phillip A. (U. S. Bureau of Commercial Fisheries, Seattle 2, Washington)
Commercial Fisheries Review 20, 17-20 (April 1958)

Two distinctly different approaches can be taken to the study of fish oils. Studies can be made either of (1) chemical reactions that employ the terminal reactive groups of the (a) triglycerides, (b) fatty acids, (c) alcohols, and (d) esters found in or made from fish oils or (2) chemical reactions of the unsaturated portion of the oil, which is a substantial component of fish oils.

The studies of reactions at the site of unsaturation, which is the approach of primary interest at the Seattle laboratory, have included epoxidation reactions and addition reactions. The studies of reactions at the terminal functional groups have included the preparation and study of (1) unsaturated quaternary ammonium salts, (2) unsaturated potassium xanthates, and (3) unsaturated sodium alkyl sulfates.

Epoxidation reactions. -- An epoxidation is an oxidation of a carbon-to-carbon double bond with an organic peracid to give an oxirane (–C–C–, with O) or an epoxy derivative.

The specific concern of research workers at the Seattle laboratory with epoxidation reaction is the preparation of the epoxy derivatives of highly unsaturated butyl or hexyl esters derived from fish oil. The resultant epoxides would be potential plasticizers and stabilizers of polyvinylchloride. The epoxides would act also as intermediates in the preparation of further products in addition to acting in their primary function as plasticizers.

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ABSTRACTER: Kathryn L. Osterhaug

ASSAY FOR OIL PEROXIDES

DEPOT FATS OF MULLET

BROWN DISCOLORATION OF OILS

FISH-OIL RESEARCH

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sodium sulfate, and the chloroform was removed by heating over a steam bath under aspirator vacuum. A clear oil was obtained, and this oil was separated into two fractions. Fraction 1 was dissolved in pure iso-octane and its conjugated double bonds were determined from its optical density at designated wave lengths in a Beckman DU Spectrophotometer with iso-octane as a blank. Fraction 2 was hydrolyzed and isomerized to its conjugated form by heating to 180° C. with a 21 percent solution of potassium hydroxide in ethylene glycol under an atmosphere of nitrogen. This solution was cooled, diluted with spectral methanol, and read as before in the spectrophotometer with a blank prepared exactly like the sample.

Results with experiment 1.--Conjugated unsaturations appeared as peaks in the curve obtained by plotting wave length against optical density or extinction coeffieient $E^{1\%}_{1\,cm.}$. These peaks appear as 2 to 6 unsaturations per molecule and they occur respectively, at wave lengths of 233, 268, 315, 347, and 374 millimicrons. The comparative heights of the peaks provide a rough measure of the quantities of the respective materials that were fed to the mullet.

Results with experiment 2.--In experiment 2, the feeding program was reversed in that all three groups of mullet were kept on the fat-free diet for 90 days after which groups 2 and 3 were placed on the marine and the fresh-water diets, respectively, for 14 days. The results of the second experiment confirm in general the results of the first experiment. Specifically, the levels of the polyunsaturated fats in the fish decreased markedly on the fat-free diet, and the nature of the body fat of the fish was markedly influenced by the dietary fat. Similarly, the comparatively small amounts of polyunsaturated acids remaining in the fish at the end of the experiment may have been the unused residues of those acids present at the beginning of the depletion period or they may have been produced from nonfatty precursors.

Conclusions.--Mullet on a fat-free diet do not synthesize fatty acids normally found in their body fat. Mullet, however, like land animals, apparently are able to convert dienoic acid from cottonseed oil into small amounts of tetraenoic, pentaenoic, and hexaenoic acids. Unlike land animals, they appear to be able to convert linoleic acid to a trienoic acid. When mullet receive a diet containing a typical marine fat such as menhaden oil, their fat stores remain almost unchanged.

4.29

Epoxidations carried out at the Seattle laboratory have used two organic peracids: peracetic acid formed in situ and preformed perbenzoic acid. At this time, perbenzoic acid seems to be the more effective reagent in the epoxidation of highly unsaturated materials.

Addition reactions.--Two types of addition reactions have been used: (1) bromine and hydrogen bromide and (2) benzene and xylene.

The purpose of the addition work with bromine and hydrogen bromide was to discover whether or not the secondary bromine atom could be displaced with trimethylamine fo form polyquaternary ammonium bromides. The displacement was found to work well in the case of a primary alkyl bromide; therefore, the addition reactions were investigated.

It was found that bromine is easily added but that hydrogen bromide is difficult to add, especially in the case of highly unsaturated materials.

The brominated products therefore were used in the attempted displacement reactions. The attempts met with failure, for dehydrobromination occurred far more easily than did displacement, and the resultant products were trimethylamine hydrobromide and an unsaturated material.

Preliminary studies have been carried out on the Friedel-Crafts addition of bezene to the carbon-to-carbon double bonds in triglycerides and fatty acids. The reaction conditions that have been tried have led to polymerization and incomplete reaction.

Reactions at the terminal functional groups.--Substances also have been prepared by utilizing reactions at the terminal functional groups. Three separate types of compounds were prepared: (1) unsaturated quaternary ammonium salts, (2) unsaturated potassium alkyl xanthates, and (3) unsaturated sodium alkyl sulfates.

Quaternary ammonium salts are known to be effective sanitizers, surface-active agents, insecticides, and fungicides.

The unsaturated xanthates have been sent to the University of Minnesota, School of Mines and Metallurgy, to be tested as possible ore-flotation agents.

When a method of assay is developed, the sulfates also will be tested as possible ore-flotation agents.

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method of analysis was used to compare the effects of various antioxidants and various antioxidant mixtures on (a) menhaden, tuna, pilchard, salmon, whale, sable, anchovy, herring, cottonseed, corn, soybean, and olive oil; (b) ethyl oleate, methyl linoleate, methyl linolenate, and methyl arachidonate; and (c) trilinolein. Examples of the data obtained are shown in figure 1 below.

Discussion.--Fats that show a fairly well defined induction period followed by rapid autooxidation should respond to the weighing method for the measurement of the induction period. Marine oils showed a fairly sharp increase in weight at the end of the induction period and were rancid in odor after they had gained 0.3 to 0.5 percent in weight in the temperature range 30° to 60° C. This type of data may be presented (1) by plotting values against time to show the increase in weight as a curve or (2) by considering the cutoff point of the induction period at a 0.4 to 0.5 percent increase in weight and reporting this time as a value. The sensitivity of the weighing method appears to be limited only to the sensitivity of the balance. Losses in weight during the induction period were not large, and if they did occur they could be accounted for by the volatility of the residual solvent or the volatility of the substrate. Highly stabilized oils retained their original weight for many weeks.

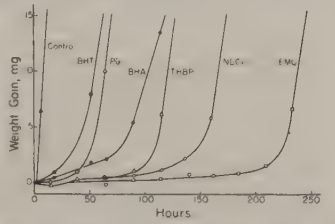

Figure 1. Effect of antioxidants (0.04%) on crude menhaden oil (1 g.) at 50° C. BHT, butylated hydroxytoluene; PG, propyl gallate; BHA, butylated hydroxyanisole; THBP, 2,4,5-trihydroxybutyrophenone; NDGA, nordihydroguaiaretic acid; EMQ, 6-ethoxy-2,2,4-trimethyl-1,2-dihydroquinoline.

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colors. Compensation for these differences was made by using the deviation ratio $R = \Delta E/\Delta E_{max}$ in which ΔE_{max} represents the distance, in Bureau of Standards units, between the original emulsion color and pure black. The extreme values of ΔE_{max} were 76.3 with cupric ion and 85.4 with butylated hydroxy toluene. All kinetic data have been plotted in terms of the deviation ratio difference, $R-R_c$, where R is the ratio for a specified emulsion and R_c is the ratio for its control. When acetylated egg albumin is replaced by unacetylated material in the emulsions or when sulfite ion is added to the otherwise unaltered emulsion, the rate of browning is increased with respect to the controls. When unsaturated lipide antioxidant or unsaturated lipide prooxidant is added, the rate of browning diminishes with respect to the control.

Discussion.--On the basis of these observations, the following reactions may be considered to occur: (a) relatively rapid, unsaturated lipide oxidation, (b) comparatively slow, unsaturated lipide oxypolymerization, and (c) active carbonyl-amine browning. Conditions augmenting oxidation of an emulsion at a given temperature tend to favor reaction (a). Lipide oxidation was increased by the replacement of air by oxygen and by the use of cupric ion and hemoglobin as catalysts.

The inhibition of active carbonyl-amine browning was achieved by acetylation of egg albumin to make amino groups unavailable for browning or by the introduction of sulfite ion to make active carbonyl groups similarly unavailable. In the absence of added prooxidative conditions, the inhibition of active carbonyl-amine browning apparently favors reactions (b), resulting in the production of more intensely colored polymers. Since the rate of browning was not inhibited when active carbonyl-amine browning was inhibited, this reaction (c) could not be the compulsory or dominant mechanism. Antioxidants or nitrogen in place of air retarded reactions (a) and (b) and may be expected to impede reaction (c) to some degree.

4.64 AN ANTAGONISTIC EFFECT WITH ANTIOXIDANTS FOR UNSATURATED FATS

Olcott, H. S. and Einset, E. (University of California, Berkeley)
Journal of the American Oil Chemists' Society 35, 159-160 (April 1958)

During a study of the effect of various antioxidants on marine oils, the authors observed that a mixture of α-tocopherol and 6-ethoxy-2, 2, 4-trimethyl-1, 2-dihydroquinoline (EMQ) provided less protection than did EMQ alone. In addition, an oil that had been stabilized with EMQ could be induced to begin to oxidize by the addition of α-tocopherol. These effects occurred at lower concentrations of α-tocopherol than are needed to demonstrate its prooxidant effect. The term "antagonism" best describes this phenomenon in contrast to the term synergism, which best describes the additive effect of mixtures of antioxidants. This study was made under contract with the U. S. Fish and Wildlife Service.

Experimental. -- Oxidation of the oils was measured by the weighing technique described in a previous paper by the same authors. Briefly, 200-milligram (mg.) samples in 10-milliliter (ml.) beakers or 1-gram samples in 50-ml. beakers that contained the antioxidant were held in constant temperature ovens. At daily intervals the beakers were removed, allowed to cool, and weighed. The end of the induction period was detected by an accelerating increase in weight. Data are reported either graphically as a plot of weight gained against time or as the length of time of the induction period from the start of the experiment until the samples gained 0.04 percent in weight.

Results. --With menhaden oil that contained 0.05 percent EMQ and various amounts of added α-tocopherol, the induction period decreased as the amount of added tocopherol was increased, until the protection afforded was approximately the same as the protection afforded by α-tocopherol alone. This same study also illustrated the prooxygenic effects of large amounts of α-tocopherol. Similar

ABSTRACTER: Martin Heerdt

6.55 FISH FEED FOR HOGS

Anonymous
Trade News 10, 9-10 (March 1958)

Fish visceral flour, a new byproduct of the fishing industry, was found to be a satisfactory protein supplement in the rations of growing and finishing swine, in tests at the Nappan, Nova Scotia, Experimental Farm, Canada Department of Agriculture. T. Cameron of Nappan's Animal Husbandry Division says the swine had no objection to the fish flour ration and that their rate of gain, feed efficiency, and carcass grade were quite satisfactory.

The hogs used in the Nappan tests received a ration of barley, oats, and minerals, plus fish visceral flour at the rate of 10 percent by weight of the grain allowance, from weaning until the pigs reached a live weight of 100 pounds. At this point the fish flour was reduced to four percent of the grain mixture and kept at this level until the pigs reached the market weight of 200 pounds.

Fish flour is prepared by collecting fresh cod and haddock viscera on board ship. Sodium nitrite, a preservative, is added to this material and the viscera are kept at a temperature of 80 to 100 degrees F., for several days. During this time most of the solids go into solution. The solution is then drum-dried and the dried material is ground into flour.

An estimated 90 million pounds of fish viscera are discarded annually in the Atlantic area. From this amount of viscera, approximately 18 million pounds of fish visceral flour could be produced each year. The fish flour used in the Nappan test was produced on an experimental basis by the Fisheries Technological Station, Halifax, Nova Scotia. Investigations on the use of this new feed are continuing at the Nappan Experimental Farm.

Reprinted in whole

4.91 FATS IN FOODS

Robe, Karl
Food Processing 19, 26-27 (April 1958)

The most recent research concerned with the effects of fats in food is centered around the role of the essential fatty acids in nutrition.

Results of work done at the Institute for Metabolic Research in Oakland, California, have indicated that two unsaturated fatty acids lower the blood cholesterol level. Work at the institute indicates that the polyunsaturated fatty acids of the linoleic family lower blood cholesterol. Fatty acids with only one double bond, such as oleic, do not.

Three of the polyunsaturated fatty acids--linoleic, linolenic, and arachidonic--previously were considered essential to proper nutrition and classified as vitamins. A limited amount of work with crude arachidonic acid indicates that this polyunsaturated fatty acid also markedly lowers blood cholesterol.

No substances studied thus far, other than the polyunsaturated fatty acids of the linoleic series, will lower the blood cholesterol for sustained periods. This does not, however, rule out other factors in oils that might contribute to lower cholesterol level. Such substances may, in fact, have a synergistic effect with linoleic or other polyunsaturated fatty acids.

The chart on the back of this card presents a graphic picture of the fatty acid composition of a number of edible fats and oils.

See chart, over.

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ABSTRACTER: Kathryn L. Osterhaug

6.9 POTENTIAL BYPRODUCTS FROM ALASKA FISHERIES: UTILIZATION OF SALMON EGGS AND SALMON WASTE

Kyte, R. M. (U. S. Bureau of Commercial Fisheries, Ketchikan, Alaska)
Commercial Fisheries Review 20, 1-5 (March 1958)

The present lack of utilization of the vast quantities of salmon viscera and trimmings that result from the Alaska salmon-canning industry primarily is caused by the remote and widely separated locations of the canneries.

For salmon-canning offal to be used for the economic manufacture of byproducts, it must either be available in large quantities or it must contain components that are so valuable they justify the high cost of collecting.

Present uses. -- The present uses for salmon waste include (1) fish-hatchery feed, (2) mink feed, (3) bait eggs, and (4) salmon-egg caviar. In 1956, 100,000 pounds of salmon viscera from Petersburg was marketed principally as fish-hatchery feed in Washington and Oregon. The development of this use for cannery offal was based on the results of fish-feeding tests conducted at the Leavenworth hatchery of the Bureau of Commercial Fisheries. Data from the Leavenworth tests indicated that salmon viscera produced a growth response superior to that of any meat product tested. Here a unique quality of the viscera and eggs may be great enough to make their recovery economically attractive.

The use of salmon offal for mink feed was investigated by Leekley, Landgraf, Bjork, and Hagevig (1952). The mink gained in weight when fed frozen salmon offal as the main portion of their diet. As the commonly used mink feed--horsemeat--becomes less plentiful, more interest may be

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ABSTRACTER: Kathryn L. Osterhaug

ANTAGONISM OF ANTIOXIDANTS

ROLE OF UNSATURATED FATS

FISH FLOUR FOR HOGS

BYPRODUCTS FROM SALMON

4.91

**FATTY ACID COMPOSITION OF FOOD FATS AND OILS*
(Values in percentages)**

	Total saturated fatty acids	Palmitoleic, one double bond	Oleic, one double bond	Linoleic, two double bonds	Linolenic, three double bonds	Arachidonic, four double bonds	Grams oil required to supply 1 gram of essential fatty acids†
Lard	42%	3%	46%	10%	0.7%	2%	780
Beef Tallow	52%	2	42	2	0.5	0.1	4000
Safflower	6%	0	21	73	0	0	135
Coconut	91%	0.2	6	2	0	0	4000
Corn	12%	0	46	42	0	0	240
Cotton Seed	24%	0	24	45	2	0	280
Olive	12%	0	8	7	0	0	1420
Peanut	18%	trace	60	22	0	0	450
Soybean	13%	0.2	28	54	5	0	175
Butterf	72%	4	32	4	0	1	2000
Menhaden	25%	16	15	7	2	17	380

Menhaden oil also contains 18% unsaturated fatty acids having more than 20 carbon atoms in a molecule. All the rest of the unsaturated fatty acids listed in the table have 16 or 18 carbon atoms in their molecular groups.

6.9 (Cross Reference: 6.70)

shown in utilizing salmon-cannery waste for this purpose.

The first commercial use made of salmon eggs was in the preparation of bait eggs for catching trout and other game fish. The growth of sport fishing in the United States has tremendously increased the demand for salmon eggs. As the supply of eggs becomes increasingly short in Washington and Oregon, more use is being made of the large amount of Alaska salmon eggs. In 1954, several thousand pounds was processed in Southeastern Alaska for use as bait.

In 1956, a small quantity of salmon eggs from Alaska was marketed as caviar. An additional food product has been suggested by Carlson, who developed a sandwich spread from smoked salmon eggs.

Potential uses.--Possibilities that have been suggested for the use of salmon offal include the production of proteins, protein hydrolysates, and amino acids. Work being done at the United States Bureau of Commercial Fisheries technological laboratories is directed toward determining which components have potential industrial value.

One potential product is salmon-egg oil. About one-third of the oil in the salmon egg is in the form of a free-oil droplet. The other two-thirds is closely associated with protein. Salmon-egg oil contains about 45 percent fatty acids with molecules having 20 and 22 carbon atoms. These molecules are highly unsaturated. Approximately one-third of the total oil is phospholipid, probably lecithin, and approximately 4 to 7 percent of the total oil is unsaponifiable matter, half of which is cholesterol.

The essential amino acids are present in good amount in salmon eggs. Of particular interest is the content of lysine, isoleucine, and methionine, which are needed for supplementation of vegetable-protein concentrates in animal nutrition.

It is proposed that enzymes acting on salmon-cannery offal may enable a cannery operator, with little additional labor or equipment, to prepare an oil-and-protein slurry. Such a process would require additional research, but if proved practical, could offer a partial solution in encouraging more complete utilization of salmon waste.

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qualitative data were obtained with anchovy, sardine, and tuna oils. When γ-tocopherol was substituted for α-tocopherol, γ-tocopherol was found to be a more effective antioxidant than α-tocopherol used alone. A limited survey indicated that the most active antagonism of the tocopherols was limited to the nitrogen containing inhibitors EMQ, diphenyl-p-phenylenediamine (DPPD), and 4-amino-p-diphenylamine (ADPA). The antagonistic phenomenon of α-tocopherol with oils containing EMQ was demonstrated with unsaturated fatty esters, acids, and a triglyceride. Phenolic antioxidants other than tocopherols did not show marked antagonism with EMQ.

Discussion.--The mechanism by which the tocopherols act as prooxidants in the presence of nitrogenous antioxidants is obscure. Preliminary findings showed that EMQ at a level of 0.01 percent had no antioxidant effect on samples of refined olive, peanut, cottonseed, or corn oil at 60° C. This finding suggests that the antioxidant effect of EMQ is neutralized by the tocopherols in these oils.

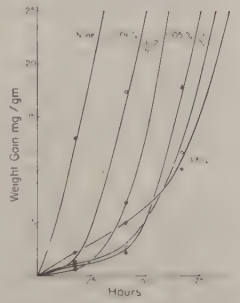

Figure 2. Effect of added α-tocopherol on the rate of oxidation of menhaden oil. The numbers refer to the concentration of α-T.

6.55

7.43 DETERMINATION OF WATER-HOLDING CAPACITY OF FRESH MEATS

Wierbicki, Eugen (Rath Packing Co., Waterloo, Iowa) and Deatherage, F. E. (Ohio State University, Columbus)
Journal of Agricultural and Food Chemistry 6, 387-392 (May 1958)

Recent studies indicate that certain qualities of meat, including texture, drip on freezing and thawing, and shrinkage on cooking, are dependent upon the degree of hydration of the muscle proteins. Water molecules, which are highly polar, are attracted to the muscle proteins by ionizable basic and acidic groups such as those that occur in arginine, histidine, lysine, glutamic acid, and aspartic acid or by polar nonionic groups such as cystine, cysteine, serine, methionine, threonine, tyrosine, and tryptophane. The mechanism of this protein hydration is not completely understood.

Lean meat contains about 3.5 grams of water per gram of protein, about ten times the water of hydration of common proteins. Muscle tissue holds both water of hydration, or electrostatically bound water, and physically bound water. Free water is considered to be that portion of the total moisture that is released by pressing or heating the meat under specified laboratory conditions.

The authors used a modification of the original method by Grau and Hamm for determining the water-holding capacity of fresh meats. The Grau and Hamm method involves pressing a 400- to 600-milligram sample of well-minced lean meat onto filter paper under constant pressure for a fixed time and measuring the area of water that has been diffused from the meat sample into the filter paper. An appropriate conversion factor is used to calculate the amount of free water in the sample. The apparatus shown in the accompanying illustration has been developed to press the meat under constant pressure.

Although the amount of free moisture pressed out of the meat varied with the amount of pressure

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 ABSTRACTER: Kathryn L. Osterhaug

7.74 PREDICTING THE COLOR OF CANNED SALMON FROM THE COLOR OF THE RAW FLESH

Schmidt, P. J. and Idler, D. R. (Fisheries Research Board of Canada, Technological Station, Vancouver, British Columbia, Canada)
Food Technology 12, 44-48 (January 1958)

This study was made to provide a more accurate method of specifying and predicting the color of canned salmon. Canadian government requirements for color apply only to canned spring salmon (Oncorhynchus tschawytscha), and they are defined in terms of Lovibond-Schofield red units. The Lovibond-Schofield instrument is suitable for measuring the color of canned salmon, but it is not suitable for measuring the color of raw salmon.

Experimental.--Sockeye salmon (O. nerka) were selected for study because of their great commercial value. This study included: (1) finding a base for visual color preference in canned salmon; (2) predicting the color of canned salmon from the color of the raw salmon flesh; (3) measuring the color of raw and canned salmon with (a) a Beckman DU spectrophotometer (equipped with reflectance attachment), (b) a Lovibond-Schofield tintometer, and (c) a Gardner color-difference meter; (4) correlating the oil content with the color of the canned sockeye salmon; (5) studying the effect of increased temperature and time of processing on the color of canned salmon; and (6) studying the effect of post-mortem storage on the color of canned salmon.

The color values obtained with the aid of the three different instruments were compared by converting them into dominant wave length values of the International Commission on Illumination. Agreement between the spectrophotometer and color-difference meter was better than between the spectrophotometer and the tintometer. Agreement was better for canned salmon than for raw salmon,

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 ABSTRACTER: Martin Heerdt

7.80 FLAVOR: CAN IT BE MEASURED? PART 2

Gould, Wilbur A.
Food Packer 39, 16-17, 46-47 (January 1958)

Interpretation of taste panel data.--Dr. John D. Tukey's statistical procedure is recommended for interpretation of the flavor data. This method of analysis permits an evaluation of results by adding the appropriate totals and the ranges and multiplying the sum of the ranges by a factor obtained from a reference table.

Four steps in tabulating the data are:

A. The judges who failed to find much difference between "treatments" are eliminated.

B. The scores of all remaining judges are tested to see if there was a measurable difference among the samples. This is done by finding the overall significant difference.

C. The extent of the difference between any two of the samples is then determined by finding the least significant difference.

D. The importance of the sample rejected is assessed. This is done by testing the percentage of replicate samples judged "not acceptable."

The detailed steps to be followed are:

A. For each judge: (1) Add scores of all replicates for each treatment, (2) determine the range between the highest and lowest score, (3) compute the grand sum of the ranges, (4) compute

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 ABSTRACTER: Richard W. Nelson

7.80 FRESH FISH QUALITY ASSESSMENT IN COMMERCIAL FISH INSPECTION

Jensen, P.
World Refrigeration 8, p. 168 (March 1957) (In English)
World Fisheries Abstracts 9, 45-46 (January-February 1958)

Quality assessment of fish is usually done organoleptically although some objective methods are used to a limited extent. Organoleptic methods have the same defects as subjective methods. Objective tests, while giving a true picture of bacteriological and chemical aspects, may not give a true picture of quality. Objective methods require special equipment and trained personnel. Therefore, in spite of disadvantages, organoleptic methods should still form the basis of fish inspection and efforts should be made to employ uniform procedures. While the objective methods are of use in scientific work and in settling disagreements about quality, it is doubtful whether they can ever replace organoleptic testing in the commercial judgment of fish.

The following is an extract of a circular from the Danish Ministry of Fisheries regarding fresh fish quality assessment.

General rules.--Fresh fish must be judged before they are washed, rinsed or treated in any other way so that possible defects may be veiled. In general, a box of fresh fish should not be considered better than the poorest quality fish in the box. First and foremost attention should be paid to the appearance and the odor, but all circumstances should be taken into consideration.

Fresh fish which are unfit for human consumption.--General characteristics: (1) Changes due to diseases. (2) Putrefaction. Putrefied fish are known by one or more of the following characteristic changes: (i) the odor changes from fresh 'seaweed' smell into sour, rancid, or rotten; (ii) the gills turn greyish or brownish and become slimy or get coated with pus; (iii) the entrails are decomposed; in uncleaned fish the digestive enzymes will frequently soften the belly in a short time so that it bursts; if the stomach or the intestinal canal contains feed, they will ordinarily have a high

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 ABSTRACTER: G. N. Subba Rao

WATER-HOLDING CAPACITY OF PROTEIN

COLOR SPECIFICATIONS FOR CANNED SALMON

FLAVOR EVALUATION

JUDGING FISH QUALITY

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probably because of the nonuniformity and irregular surface texture of the latter. The color-difference meter was convenient, rapid, and more accurate than the spectrophotometer because a larger sample area could be viewed. The "Rd" scale and a large area of illumination without a cover plate were used in making color-difference meter measurements of raw and canned salmon.

Results.--With porcelained steel tiles used as reference standards, the "Rd," "a," and "b" values for raw salmon were, respectively, 8.73, 33.8, and 20.7; whereas the same values for canned salmon were, respectively, 39.5, 15.4, and 24.1. Reflectance spectra values for salmon flesh before and after canning showed that processing increased the brightness of color throughout the visible region. Processing also caused (1) the salmon flesh to become much lighter in color, (2) the hue of salmon flesh to shift from red to orange-red and orange, and (3) the purity of canned salmon color to decrease.

The Gardner color-difference meter was found to be suitable for the measurement of color in raw and canned sockeye salmon. The "a" value alone was not only suitable for measuring the color of canned salmon but also could be predicted from the "a/b" ratio of the raw salmon. Excellent correlation existed between the "a/b" ratio and the dominant wave length, whereas very good correlation existed between the "a" value alone and the dominant wave length. Three grades that were based on "a/b" ratios were proposed by the authors for raw salmon, and three grades that were based on "a" values were proposed by the authors for canned salmon. The proposed grade for raw salmon with an "a/b" ratio less than 1.37 was grade 3, between 1.37 and 1.67 was grade 2, and more than 1.67 was grade 1. The proposed grade for canned salmon with an "a" value of less than 14.5 was grade 3, between 14.5 and 20 was grade 2, and more than 20 was grade 1.

Canned sockeye salmon with a high oil content usually had the more desirable color. Small increases in the time and temperature of processing resulted in slightly greater color losses. A 5° C. increase in the processing temperature or a 30-minute increase in the length of the processing time was required to show an increase in color loss. These color losses during processing were not affected by the post-mortem storage of the fish in ice or in refrigerated sea water prior to canning.

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content of bacteria; the result is that the entrails get spoiled and the rotten odor spreads to the flesh with variable speed; (iv) the belly and the surface of the cuts from dressing turn slimy and often get a yellowish or brownish discoloration; (v) the flesh becomes soft, loose, and inelastic; it is easy to press the fingers through the belly. (3) Contamination. (4) Rancidity. In fat fish, particularly mackerel and salmon, the fat may turn rancid before the flesh is spoiled. This is especially the case if the fish are kept cool but insufficiently protected from the influence of air, i.e., if mackerel are stored at 0° C. (32° F.) without being covered with ice. Rancidity become apparent by tawny discoloration, in particular under the skin along the lateral line, and by a rancid, varnish-like odor.

Special characteristics of putrefaction for certain species.--(1) Ray. The slime dries up and the fish smells of ammonia. (2) Cod and allied species. The eyes become dull, greyish and sunken, and the slime acquires a glue-like, tough consistency. (3) Herring, sprat, and mackerel. Bursting of the belly owing to a quick putrefaction of the entrails. (4) Tunny. Smell of fish oil. (5) Mackerel shark. The fish give off a penetrating smell of ammonia. A slight smell of ammonia does not indicate spoilage. (6) Salmon. Dark spots appear on the inside of the belly, and the bones are loosened from the flesh, which acquires a sour odor. (7) Common lobster and Norway lobster. A pronounced rotten and ammonia-like odor. The shell becomes soft. For Norway lobster, the putrefaction starts between the body and the tail, and the hind-part of the body turns dark-greyish. (8) Mussels and oysters. Dead animals must be condemned. The shells of dead animals are open or easy to open and do not shut tightly when given a crack. (9) Fish fillets. The fillets get slimy and tawny. (10) Cod roe. The roe gets slimy.

Fish that can be used only for special purposes.--If the above-mentioned characteristics of spoiled fish (except rotten odor) are present only to a slight degree so that the fish are neither unfit for human consumption nor of a perfectly good condition, the fish inspectors decide for what purpose the fish may be used, and mark the fish accordingly. Such fish, however, may not be exported.

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applied, it was not directly related to the magnitude of the pressure, but rather a stepwise increase occurred as the pressure was increased. Presumably, the water in meat is bound by the muscle proteins with different forces to form several layers around the protein molecule. Each layer requires a different pressure to be released.

The results are calculated as follows: The free moisture area is determined by subtracting the surface of the meat film from the total moisture area. The difference multiplied by the regression coefficient of 61.10 milligrams of water per square inch gives the amount of free water in the meat sample. Another sample of the same meat is used to determine the total moisture content. The results are expressed as the percent of the free water out of the total moisture content of the meat:

$$\text{Percent free } H_2O = \frac{(\text{total area} - \text{meat film area}) \times 61.10}{\text{total moisture (mg.) in muscle sample}} \times 100$$

Figure 1. Hydraulic meat press with pressure gage

7.80

grand range of the treatment sums, (5) calculate the overall significant difference, and (6) evaluate each judge's performance.

B. For each treatment: (1) add the sums of replicate scores for each of the judges not eliminated, (2) compute the range of the sums for the remaining judges in each treatment, and (3) count the number of unacceptable samples in all of the replicates.

C. For all treatments, all judges: (1) determine the range of the total scores for each treatment, (2) obtain the judge total by adding the range of judge sums for each treatment, (3) determine the overall significant difference values to determine whether any significant differences exist among treatments, and (4) determine the least significant difference values that will permit an evaluation of differences between any two treatments.

D. Percentages not acceptable: determine the percentage of unacceptable ratings.

1.71 DOGFISH

Tarr, H. L. A.
Progress Reports of the Pacific Coast Stations, Fisheries Research Board of Canada No. 110, 13 (April 1958)

The problem of commercially utilizing sharks has been considered, usually unsuccessfully, by many research organizations in a number of countries. These elasmobranch fishes, which come under the general class Selachii, differ from their more bony relatives, the teleost fishes, by having several distinguished features: (1) they have a cartilaginous and not a calcified internal skeleton; (2) they have a comparatively high content of nonprotein nitrogen, which is more than double the amount found in most teleost fishes. A large proportion is in the form of urea and trimethylamine oxide; and (3) they ordinarily have large, fatty livers. The scientific literature indicates that with the exception of data on liver oils, little information is available concerning sharks, including the Pacific Coast dogfish (Squalus suckleyi).

On the west coast of Canada, attempts have been made to utilize dogfish but with no lasting success. The various avenues of utilization that have been explored are (1) direct use in human food, for example, as fresh or canned dogfish, (2) use in production of liver oil, and (3) use in production of oil and meal.

Use in food. -- In certain countries where protein foods are not abundant, such as in Great Britain, dogfish have become accepted as a staple food. If dogfish are to be used for human food, however, they must be handled properly to prevent bacterial spoilage. Otherwise, urea breaks down to give high concentrations of ammonia, and the trimethylamine oxide is reduced to trimethylamine. Methods of cooking dogfish usually employ citric, acetic, or lactic acid to neutralize any ammonia or trimethylamine that may be present. On this continent, dogfish are less acceptable to consumers than are some of the cheaper varieties of teleost white-fleshed fish. Masking the taste by means of a batter such as is used on fish and chips might offer a solution to the problem.

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 ABSTRACTER: F. Bruce Sanford

7.89 ANALYSIS OF THE PROTEIN CONSTITUENTS OF DRIP FROM THAWED FISH MUSCLE

Seagran, Harry L. (Fishery Products Laboratory, Ketchikan, Alaska)
Food Research 23, 143-149 (March-April 1958)

Previous findings have suggested that a disturbance of the intracellular hydrated contractile protein equilibrium rather than a disturbance of the sarcoplasmic fraction is responsible in part for the liberation of drip from thawed fish muscle. This study was made (1) to determine the protein constituents of drip, (2) to compare these constituents with the known major protein fractions of fish muscle, and (3) to detect any relative changes in the ionic characteristics of these proteins when fish muscle is frozen.

Experimental. -- Conventional fractionation and electrophoretic methods were used (1) to determine the types of proteins present in drip and (2) to compare the electrophoretic mobilities of drip proteins with similar proteins isolated from fresh fish muscle. Drip and extracts isolated from the white muscle tissue of yellow-striped rockfish (Sebastodes nebulosus) were used in this study. A standardized method was used to obtain centrifuge drip from coarsely ground frozen flesh that had been thoroughly mixed and packed into centrifuge tubes. Tube samples were thawed in running, cold tap-water for 30 minutes, centrifuged for 30 minutes, and filtered by gravity through sintered glass. Centrifuge drip that contained about 4 percent protein was used directly for qualitative fractionation tests and for electrophoretic analyses.

Low ionic strength tissue extractions of fresh muscle were carried out by the method of Dingle, Eagles, and Neelin (1955) to obtain the sarcoplasmic fraction only for comparative tests. These extracts contained about 2 percent protein and were used directly for electrophoretic analysis that was

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 ABSTRACTER: Martin Heerdt

8.51 AMINO-ACID COMPOSITION OF HEMOGLOBIN FROM THUNNUS THYNNUS

De Marco, C. and Antonini, E. (University of Rome and Zoological Station of Naples, Italy)
Nature 181, 1128 (April 19, 1958)

The authors recently crystallized hemoglobin and myoglobin from the marine fishes Palamys sarda and Thunnus thynnus and described the physico-chemical and functional properties of these pigments. This paper reports on the amino acid composition of Thunnus thynnus hemoglobin as chromatographed on an ion-exchange resin according to the method of Moore and Stein, slightly modified.

Experimental. -- Hemoglobin crystals obtained from ammonium sulphate were dissolved in water, dialyzed against water, and hydrolyzed with 6 N hydrochloric acid for 24 hours. The amount of protein present in each sample that was chromatographed was calculated on the basis of the nitrogen content of the sample. Nitrogen was determined in quadruplicate by the micro-Kjeldahl method and calculated on the basis of an assumed value of 16 for the percentage of nitrogen. Two different hydrolysates of the same sample of crystals were used for analyses.

Results. --Results appear in tabular form (see over). Values for proline were calculated by the use of the formula reported in the method of Moore and Stein because the authors did not obtain a good separation of proline from glutamic acid.

See table 1, over.

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 ABSTRACTER: Martin Heerdt

8.8 A CONSUMER SURVEY VERSUS PANEL TESTING FOR ACCEPTANCE EVALUATION OF MAINE SARDINES

Murphy, Elizabeth F.; Clark, Berton S.; and Berglund, Ralph M.
Food Technology 12, 222-226 (May 1958)

The flavor of Maine canned sardines prepared by five different methods of processing was evaluated organoleptically by three independent taste panels and by the use of a consumer preference survey. A standard sample processed by the conventional method of canning was used for comparison.

Taste panel evaluations. -- A ranking technique was used to evaluate the samples. Whole drained sardines in complete blocks of 6 samples with 3 replicates were evaluated by 10 panel members selected for acuity. Whole drained sardines in balanced incomplete blocks of 30 samples with 5 replicates were evaluated by 24 panel members who had not been selected for their tasting ability. Drained, eviscerated, filleted sardines cut into bite-size pieces and presented in balanced incomplete blocks of 3 samples with 5 replicates were evaluated by 43 experienced panel members not selected for acuity.

Location of acceptance surveys. -- Consumer acceptance surveys were carried out with equal numbers of families in each of 12 cities in the United States. These consumers evaluated sardines canned (1) by the conventional method and (2) by a trial method. Consumers per pair of samples varied from 1000 to 1070. Upon tasting the samples, each consumer indicated a preference for one of a pair of samples as well as the degree of difference between the two samples.

Analysis of data. -- Data from the taste panel studies and data from the consumer survey were

(over)

 ABSTRACTER: Martin Heerdt

DOGFISH UTILIZATION

ANALYSIS OF DRIP PROTEINS

COMPOSITION OF TUNA HEMOGLOBIN

SARDINE TASTE TESTS

7.89

carried out in a horizontal, open, strip-type apparatus.

Results.--A definite similarity was found between the protein composition of drip and the extracts of low ionic strength that were obtained from fresh fish muscle. Seven components divisible into 3 mobility groups by paper electrophoresis were established in the centrifuge drip obtained from white muscle of yellow-striped rockfish. When the patterns obtained with centrifuge drip from frozen and thawed rockfish were compared with the extracts of low ionic strength from fresh rockfish, no differences were revealed in the number of components present. No relative change in the mobilities of the component proteins of drip was observed as a result of freezing fish muscle. The author suggests that the sarcoplasmic protein fraction of fish muscle is not intimately associated with the origin of drip because of (1) the similarities between the number and ionic characteristics of the protein constituents of drip and extracts of low ionic strength from fish muscle and (2) the absence of the contractile protein, actomyosin, in drip.

8.8

submitted to analyses of variance except that data from the American Can Company taste panel was analyzed by a chi square method.

Results.--Members of all the taste panels and consumers in all of the taste surveys detected significant differences between the samples. All panel members and all consumers agreed that sample 53, the standard Maine sardine sample, and samples 41, 59, and 82 were significantly preferable to samples 23 and 37. Only one taste panel indicated that samples 41, 53, and 59 were significantly better than sample 82.

Re-evaluation of highest ranking samples.--Sample 53, the standard sample, and samples 41, 59, and 82, the four samples that received the highest rank, were re-evaluated by a taste panel of 22 members who were selected for acuity. Re-evaluation was carried out by the Sheffe pair-comparison method. Analysis of variance of the sample preferences indicated by this group showed the existence of no difference among samples 41, 59, and 82. Analysis of the degrees of difference between the pairs showed that sample 59 was significantly better than sample 41 and sample 53. This difference was not detected by the consumer group when the analysis was based on the mean scores.

1.71

Dogfish have been canned, but urea is decomposed by heat, even at 176° F. Above 212° F., it breaks down rapidly, yielding ammonia and carbon dioxide. Canning therefore has no promise unless a process can be devised in which ammonia can be removed, as by some vacuum method.

Liver oil.--The liver oil contains 9.5 to 35 percent of unsaponifiable matter, with an average of 22 percent. About 18 percent of the liver oil is composed of glycerol mono-ethers, chiefly selachyl alcohol (glycerol-α-ether of oleyl alcohol) and some chimyl alcohol (glycerol-α-ether of cetyl alcohol). The liver oil contains a little (0.1 to 0.6 percent) squalene and a few percent of cholesterol. A small market exists for the vitamin A in the liver oil. No market has been found for the other constituents.

Reduction products.--A problem that requires further investigation is the method of preparation of dogfish meal. Although further work may lead to improvements, the yield of meal always will be lower than that obtainable from herring if conventional continuous procedures are used, owing to the nature of dogfish flesh.

In 1942, the effects of methods of production on the properties of dogfish meal were published in a bulletin from the State College of Washington. This is the only comprehensive work available concerning dogfish meal. It is out of date, however, as regards the methods used to evaluate nutritive quality of the protein.

Since urea has no nutritive value for poultry, it would be necessary to sell the dogfish meal on the basis of its protein nitrogen rather than on total nitrogen.

Summary.--Profitable use probably can not be found quickly for dogfish unless an export market can be created for them as edible fish. Information is needed concerning their bacterial spoilage and its control, their nutritive value, and their chemical composition. Although such information could not be expected to result in immediate utilization of the fish, basic research is a method of attack that in the long run, could prove profitable.

8.51

Table 1.--Amino-acid composition of crystalline Thunnus thynnus hemoglobin (gm. amino-acid/100 gm. protein)

Amino-acid	Hydrolysate 1				Hydrolysate 2		Mean
Aspartic acid	11.77	11.00	9.97	11.69	11.4	11.28	11.18 ± 0.31
Threonine	4.67	4.5	4.47	4.48	4.12	4.04	4.38 ± 0.09
Serine	4.71	4.85	4.51	4.51	4.10	4.24	4.48 ± 0.16
Glutamic acid	6.90	6.89	7.14	6.67	6.54	5.88	6.67 ± 0.18
Proline	2.45	1.66	2.58	2.93			2.40 ± 0.28
Glycine	4.45	4.49	5.08	4.38	3.87	3.82	4.34 ± 0.22
Alanine	9.04	8.35	7.68	8.92	8.58	8.39	8.49 ± 0.22
Valine	7.01		7.92	8.12	6.21	6.89	7.28 ± 0.35
Methionine	3.22		2.37	2.37	2.51	3.59	2.81 ± 0.26
isoLeucine	5.90		5.63	6.10	5.32	5.48	5.68 ± 0.19
Leucine	12.74		11.80	11.73	11.11	11.28	11.73 ± 0.30
Tyrosine	4.81	4.99	4.72	4.73	4.37	4.16	4.63 ± 0.12
Phenylalanine	6.69	6.65	6.82	6.44	5.93	5.70	6.37 ± 0.19
Histidine	4.04	3.98	4.20		4.42	4.02	4.13 ± 0.10
Lysine	8.95	8.40	8.15		8.97	8.75	8.64 ± 0.21
Arginine	5.67	5.73			5.46	5.49	5.58 ± 0.18
						Total	98.74

0.5 THE DETERMINATION OF ESCHERICHIA COLI IN SEA WATER

Johannesson, J. K. and Martin, R. E.
J. app. Bact. 20, 151-157 (1957)
Water Pollution Abstracts 31, 86 (March 1958) (London, England)

For the determination of Esch. coli I in sea water, it was found that lactose broth frequently gave higher presumptive and confirmed counts than did MacConkey's broth.

0.5 FLUORESCENCE OF THE TOXIN OF CLOSTRIDIUM BOTULINUM AND ITS RELATION TO TOXICITY

Boroff, Daniel A. and Fitzgerald, John E. (New England Institute for Medical Research, Ridgefield, Connecticut)
Nature 181, 751-752 (March 15, 1958)

Botulinum toxin is fluorescent when activated by a specific wave length in the ultraviolet, and the intensity of the fluorescence is related to the toxicity.

1.01110 CANADIAN FISHERIES RESOURCES--THE PROSPECTS

Anonymous
Canadian Fisherman 44, 4-6, 7-8, 10 (November 1957)

A condensation of the chapter on Resources contained in the Report made by the Federal Department of Fisheries and submitted to the Royal Commission on Canada's Economic Prospects.

1.01111 HISTORY OF THE GREAT FISHERY OF NEWFOUNDLAND

De Loture, Robert (Marine Academy, Paris)
Special Scientific Report: Fisheries No. 213, 147 pp. (April 1957) U. S. Department of the Interior, Fish and Wildlife Service, Washington 25, D. C.

1.0113 PACIFIC COAST FISHING PORTS--GARBALDI, OREGON

Sanford, F. Bruce (Fishery Technological Laboratory, Bureau of Commercial Fisheries, Seattle, Washington)
Commercial Fisheries Review 20, 48-56 (January 1958)

This article is a photographic report of the fishing industry of Garbaldi, Oregon. It covers the use of fillet waste for mink feed as well as the commercial handling of salmon, crab, and bottom fish. Thirty-nine photographs are used to tell the story.

2.143 THE RESPONSE OF TUNA AND OTHER FISH TO ELECTRICAL STIMULI

Miyake, Iwao and Steiger, Walter R. (University of Hawaii, Honolulu)
Special Scientific Report: Fisheries No. 223, pp. 1-23 (June 1957) U. S. Department of the Interior, Fish and Wildlife Service, Washington 25, D. C.

Theoretical studies are presented of the potential electric field, and current density for spherical electrodes submerged in a large body of water. The problem of the relationship between the head-to-tail potential and current density of a fish as determined by the relative conductivities of the fish and water is also investigated.

2.144 A RUSSIAN FISHING REVOLUTION: NO HOOKS--NO LINES--NO NETS

Anonymous
Maine Coast Fisherman 12, 12 (March 1958)

Underwater lights and a fish pump have been used by the Russians to catch 1,500,000 tons of Kilka (a sardine-like fish) in the Caspian Sea.

2.3 EFFECTS OF TEMPERATURE UPON THE STORAGE LIFE OF FRESH, SHUCKED PACIFIC OYSTERS (OSTREA GIGAS)

Liebman, Harmon L.; Kudo, George; Chapel, Julia G.; and Stern, Joseph A.
Commercial Fisheries Review 19, 1-4 (December 1957)

(Abstract of this article appears under 2.01 page 3 - April 1958)

2.3 EQUIPMENT FOR WATER TREATMENT

Anonymous
Food Manufacture 32, 555 (December 1, 1957)

Water clarification; diatomaceous earth filtration; sheet filters; centrifugal clarification, water softening; sterilization; water meters; and porous ceramic diffusers.

2.9 BIOCHEMICAL STUDIES ON SQUID MEAT FOOD POISONING

Murata, Kiichi, Oishi, Kenichi, and Iida, Atsushi
Bulletin of the Faculty of Fisheries Hokkaido University 8, No. 1, 74-86 (May 1957) (English abstract, tables, and figures)

I. Identification of amines in squid meat during the period of preservation. --Three kinds of squid meat samples were prepared and held at 11.5° C., 18.5° C., and 27.0° C. During this holding period, measurements were made of surface changes, pH values, volatile basic nitrogen content of trichloroacetic acid extractives, and amine production. The following amines were detected: putrescine, cadaverine, ammonia, monomethylamine, trimethylamine, isoamylamine, β-phenylethylamine, histamine, tyramine, octopine, agmatine, arcaine, creatine, and methylguanidine.

II. Increase and decline of amines of squid meat during preservation. -- Trimethylamine production increased in keeping with increases in volatile basic nitrogen and with the temperature at which the squid meat samples were preserved. A slight amount of histamine was detectable 96 hours after the sampled squid were caught. A small amount of tyramine was present and the amount increased gradually.

2.9 THE POISON OF A BARRACUDA, SPHYRAENA PICUDA

Hashimoto, Yoshiro (Univ. Tokyo)
Nippon Suisangaku Kaishi 21, 1153-7 (1955-56)
Chemical Abstracts 52, 4055 (March 10, 1958)

3.2490 BIOCHEMICAL CONDITION OF WHALE MEAT PRIOR TO FREEZING AND COLD STORAGE OF FROZEN MEAT

Tanaka, T. and Tanaka, K.
Proc. 9th Int. Congr. Refrig., Paris, pp. 4078-4083, 4092-4095 (1955)
Food Science Abstracts 29, 406 (October 1957)

Before freezing, the changes in pH and "weep" values were measured on a block of lean meat cut from a fin whale and kept at 15° C. for 4 days. After freezing in a multiplate freezer at -29° C., blocks of meat were stored at -8°, -16°, and -24° C. for several months, and changes in amount of drip, pH value, content of adenosinetriphosphate (as an index of contractability) and the ratio of soluble protein nitrogen to soluble total nitrogen (as an index of degeneration of protein) were determined. To ensure suitable chemical composition and a minimum amount of drip on thawing, whale meat should be frozen in its prerigor state, and contractability should be inhibited just before thawing, by storage at -2° C. for 4 days or at -3° C. for 10 days.

3.2490 EXPERIMENTS ON THE PRESERVATION OF FISH FILLETS BY FREEZING

Botalla, G., Bruss, O., Daghetta, A., and Monzini, A.
Ann. Sper. agr. (N.S.) 10, 1651-1661 (1956)
Food Science Abstracts 29, 522 (December 1957)

Fillets of hake (Merluccius merluccius), perch (Perca fluviatilis), and mackerel (Scomber scomber), wrapped in Cryovac, Neothene (a polyethylene film), or cellophane film, were stored at -18° C. for 6 months. The chemical changes which appeared to be most injurious to the quality of the frozen fish are those concerned with the lipids, and especially those which lead to the oxidation of unsaturated fatty acids. The fish fillets kept in good condition for 4 months.

3.2493 EFFECT OF GLAZING ON QUALITY, PRESERVATION AND EXTENSION OF STORAGE LIFE OF FROZEN FISH

Piskarev, A.
Kholod. Tekh. 31, No. 3, 51-54 (1954) (U.S.S.R.)
Food Science Abstracts 29, 523 (December 1957)

Sturgeon, carp, and other fish were ice-glazed, and stored at -18° to -20° C.; similar fish were stored unglazed, as controls. The sturgeon were piled as glazed; whereas the other fish were placed in paper-lined cases. All fish were examined after 4, 7, and 11 months of storage. Glazing prolonged the storage life of the fish by 4 to 5 months. Fish stored at -18° C. will keep for 8 to 10 months if the weight of the glaze is 7 to 8% of the weight of the fish, or for 4 to 5 months if the glaze is 4.5 to 5%. Sprats frozen in blocks and glazed kept for 4 months at -18° C.

3.2493 STORAGE OF COD LIVER AT LOW TEMPERATURE

Kaminarskaya, A.
Kholod. Tekh. 31, No. 3, 55-57 (1954) (U.S.S.R.)
Food Science Abstracts 29, 524 (December 1957)

Experiments on the storage of fresh, washed cod liver, in cans or wrapped in parchment paper, are described. Results showed that frozen cod liver could be stored for 2 weeks at -25° C., for 2 months at -35° C., and for up to 5 months at -50° C. without change in the peroxide value and acidity of the oil or in vitamin A content.

3.336 A NEW PROCESS FOR CONTINUOUS BULK STERILIZATION AND HIGH TEMPERATURE FILLING OF LOW-ACID FOODS

Smith, H. L., Jr. and Ball, C. O.
Food Manuf., 30, 139-143 (1955)
Food Science Abstracts 29, 197 (April 1957)

3.336 STRUVITE IN CANNED MARINE PRODUCTS. III. RELATION BETWEEN THE STRUVITE FORMATION AND MANUFACTURED CONDITIONS OF CANNED CRAB

Yamada, Haruo (Research Lab. Nippon Marine Prods. Co., Odawara)
Nippon Suisan Kabushikikaisha Kenkyusho Hokoku No. 8, 1-7 (1957)
Chemical Abstracts 51, 15032 (October 10, 1957)

4.11 MEASUREMENT OF POLYUNSATURATED FATTY ACIDS

Holman, Ralph T. (Univ. of Minnesota)
Methods of Biochem. Analysis 4, 99-138 (1957)
Chemical Abstracts 51, 9778 (July 10, 1957)

4.11 SOUTH AFRICAN PILCHARD OIL 7. THE ISOLATION AND STRUCTURE OF AN OCTADECATETRAENOIC ACID FROM SOUTH AFRICAN PILCHARD OIL

Matic, M. (South African Council for Scientific and Industrial Research, Pretoria, South Africa)
The Biochemical Journal 68, 692-695 (April 1958)

A cis-n-octadeca-6:9:12:15-tetraenoic acid has been isolated from South African pilchard oil, and some of its properties have been determined. Similar acids have been isolated from herring oil, pilchard oil, and sardine oil by other workers.

4.92 NUTRITIVE VALUE OF WHALE OIL. VII. NUTRITIVE VALUES OF GLYCERIDE AND WAX (PURIFIED WITH CASTOR-SEED LIPASE) SEPARATED FROM THE HEAD AND BLUBBER OILS BY MOLECULAR DISTILLATION

Fujii, Hisashi and Okura, Shunichi (Research Lab. Nippon Marine Prod. Co., Odawara)
Nippon Suisan Kabushikikaisha Kenkyusho Hokoku No. 8, 35-8 (1957)
Chemical Abstracts 51, 15032 (October 10, 1957)

4.92 FISH DIET CURBS HEART DISEASE

Casey, Mary (Halifax Chronical Herald, Nova Scotia)
Canadian Fisherman 44, 16 (November 1957)

Halifax hospital doctors optimistic after two-year study. Believe fish instead of animal fats may help reduce heart disease.

6.10 TECHNOLOGICAL STUDIES ON THE PROCESSING OF SEA LIONS

Kyte, Robert M.
Commercial Fisheries Review 18, 1-7 (June 1956)

(Abstract of this article appears under 1.95 page 1 - February 1957)

6.10 ATTEMPTS TO EVALUATE THE ECONOMIC OPERATION OF FISH-MEAL PLANTS OF THE STORD-MYREN TYPE

Sola, E.
Fiskeridir. Skr., Ser. tech. Undersøk 3, No. 2, 41 pp. (1955)
Food Science Abstracts 29, 527 (December 1957)

On the basis of data collected from different fish-meal factories in Norway, theoretical calculations were made to determine the most profitable production under various conditions, e.g. the minimum amount of raw material which must be supplied to get a reasonable return when working with fatty or lean fish and fish offal. The calculated values apparently depend upon many different factors, and are subject to great fluctuations from place to place and from time to time. General conclusions cannot, therefore, be drawn in a short survey. Diagrams show how profits are a function of the method of processing and the amount of raw material that can be supplied.

6.52 THE PARTIAL PURIFICATION AND PROPERTIES OF A THIAMINASE FROM BRACKEN PTERIDIUM AQUILINUM (L.) KUHN

Kenten, R. H. (Rothamsted Experimental Station, Harpenden, Herts, England)
The Biochemical Journal 67, 25 (September 1957)

6.52 UTILIZATION OF FISH WASTE IN NORTHERN OREGON FOR MINK FEED

Sanford, F. Bruce (Bureau of Commercial Fisheries, Seattle 2, Washington)
Commercial Fisheries Review 19, 40-47 (December 1957)

This is a picture-story of the manufacture of mink feed from fish waste in Oregon. Twenty-three bibliographical references are included.

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

Analyst
Analytical Chemistry
Archives of Biochemistry and Biophysics
Biochemical Journal
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Chemistry
Canadian Journal of Technology
Canner and Freezer
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Processing
Chemistry and Industry
Commercial Fisheries Review
Drug and Cosmetic Industry
FAO Fisheries Bulletin
Federation Proceedings
Feed Bag
Feedstuffs
Fisheries Newsletter (Australia)
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishing Gazette
Food Engineering
Food Manufacture
Food Packer
Food Preservation Quarterly
Food Processing
Food Research
Food Science Abstracts
Food Technology
Frosted Food Field
Gourmet
Industrial and Engineering Chemistry
Industrial Refrigeration
Institutions
Journal of Agricultural and Food Chemistry
Journal of Applied Chemistry
Journal of Biological Chemistry
Journal of Nutrition
Journal of Organic Chemistry
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Chemical Society (London)
Journal of the Fisheries Research Board of Canada
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Pan American Fisherman
Poultry Science
Practical Home Economics
Progressive Fish-Culturist
Quick Frozen Foods
Refrigerating Engineering
Report of the Food Investigation Board (Great Britain)
Science
Southern Fisherman
Trade News (Fisheries Department, Canada)
Western Fisheries
World Fisheries Abstracts
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above listed publications are included. Biological papers are generally omitted.

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Editorial Clerk (Typist)--Gladys K. Chandler

6.79 DETERMINATION OF THE SURVIVAL OF HAKE ROE

Rodero Franganillo A.; Peinado Lucena, E.; Pozo Lora, R.; and Jordano Barea, D.
Anales de Bromatologia 8, No. 3, p. 325 (1956) (Madrid, Spain)
World Fisheries Abstracts 9, 27-28 (March-April 1958)

The viability of the eggs is lost rapidly when refrigeration is extended for more than 24 hours, or if the eggs are kept for 11½ hours at 15° C.

6.79 DETERMINATION OF ESTROGENS IN HAKE ROE

Pozo Lora, R.
Anales de Bromatologia 8, No. 3, p. 323 (1956) (Madrid, Spain)
World Fisheries Abstracts 9, 27-28 (March-April 1958)

Fifteen g. of fish roe were extracted with boiling alcohol for 15 min. The solution was acidified with HCl and the classic Cuboni technique was used. In every case, the presence of estrogens (female sex hormones) were demonstrated. It is considered that hake roe can produce a feminizing effect on habitual male consumers and because of this property the product can be used in medicine.

6.79 CONTRIBUTION TO THE INSPECTION OF HAKE ROES

Jordano Barea, D. and Pozo Lora, R.
Anales de Bromatologia 8, No. 3, p. 327 (1956) (Madrid, Spain)
World Fisheries Abstracts 9, 27-28 (March-April 1958)

Studies made on hake roe were: histology, estrone, ovule, nutritive cells, vitelline membrane vitellus, morphoplasm, nucleolus, modifications. Among these several nematodes and a new cestode were identified.

7.47 SIMPLIFIED MICRO-GAS ANALYSIS

Dale, Robert F.
Modern Packaging 30, 151-152 (July 1957)

Revised reaction chamber and improved methodology are found to give more uniform results in the testing of nitrogen-atmosphere pouches.

7.47 THE DIRECT ESTIMATION OF AMMONIA IN SEA WATER, WITH NOTES ON NITRATE, COPPER, ZINC, AND SUGARS

Atkins, W. R. G.
J. Cons. int. Explor. Mer. 22, 271-277 (1957)
Water Pollution Abstracts 31, 89 (March 1958) (London, England)

A colorimetric method for the determination of ammonia in sea water, using chloramine-T and a pyridine-pyrazolone reagent is described.

7.593 STUDIES ON THE ORGANIC PHOSPHATES IN MUSCLE OF AQUATIC ANIMALS II. ON THE DETERMINATION OF CREATINE PHOSPHATE IN MUSCLE OF CARP

Saito, Tsuneyuki and Arai, Ken-ichi
Bulletin of the Faculty of Fisheries Hokkaido University 7, No. 3, 243-246 (November 1956)

7.593 DETERMINATION OF SMALL AMOUNTS OF HISTAMINE

Schmidt, Felix and Gruhn, Ingetraud (Univ. Jena, Ger.)
Naturwissenschaften 42, 391-2 (1955)
Chemical Abstracts 51, 18066 (November 25, 1957)

Determination of histamine by colorimetry of the pigment formed by coupling with diazotized p-nitroaniline or diazobenzenesulfonic acid must be closely controlled as to pH and temperature in order to avoid multiple coupling.

7.80 METHODS FOR RATING QUALITY AND INTENSITY OF THE PSYCHOLOGICAL PROPERTIES OF FOODS

Schwartz, Noel and Foster, Dean (United States Testing Company, Inc., Hoboken, New Jersey)
Food Technology 11, 15-20 (September 1957)

The authors have outlined psychophysical methods for rating the psychological properties of foods and have introduced a number of concepts that may be new to the food technologists. For example, the jnd is the quantal unit of psychophysics that represents a just noticeable difference. Forced-choice, equal appearing intervals, successive intervals, average error, judgement time, and single stimuli are the names of various methods for which administrative and computational techniques have been thoroughly worked out. This study compares the familiar quality of scoring techniques with the panel rating scale method.

7.80 STATISTICAL DEVELOPMENT OF OBJECTIVE QUALITY SCORES FOR EVALUATING THE QUALITY OF FOOD PRODUCTS

Tarver, Mae-Goodwin and Schenck, Anna May (Continental Can Company, Chicago, Illinois)
Food Technology 12, 127-131 (March 1958)

Development of the scoring scales.--Subjective quality measurements have a tendency to drift or to change in meaning with time and with judges unless they are anchored to a reproducible objective scale. The relationship between the objective and the subjective scales is easily determined by statistical methods, and the precision of quality judgements is assessed by such methods.

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Fluorescence of Clostridium botulinum toxin	17	0.5
Transportation		
Air-borne lobsters	3	2.5

7.89 THE DETERMINATION OF QUALITY IN FISH BY MEANS OF FLUORESCENT COMPOUNDS

Aker, Harry and Appleman, Milo Don (Univ. of Southern California, Los Angeles)
Bacteriol. Proc. (Soc. Am. Bacteriologists) 54, 18-19 (1954)
Chemical Abstracts 51, 15829 (October 25, 1957)

Oils from the fish were extracted with $CHCl_3$; the extracted fish was dried and incubated with pancreatin to extract the fluorescent compounds which were measured in a fluorophotometer.

7.89 TETRAZOLIUM REDUCTION AS AN INDEX OF SPOILAGE IN CURED FISH

Rao, Suryanarayana S. V.; Nayar, Rajendranathan M.; and Valson, A. P. (Central Marine Fisheries Research Sta., Mandapam Camp)
Current Sci. (India) 25, 396-7 (1956)
Chemical Abstracts 51, 17010 (November 10, 1957)

A method is described for detection of fish spoilage by using triphenyltetrazolium bromide reduction as the indicator.

8.42 FISH MEAL 1. SALT CONTENT OF FRESH PILCHARDS

Rowan, A. N. and Stander, G. H.
Annual Report of the Fishing Industry Research Institute, Cape Town, South Africa 9, 19 (1955-1956)

The amount of salt in eviscerated pilchards, in pilchard viscera, and in the material removed from pilchard viscera was determined to learn of its effect on the salt content of pilchard meal. Pilchard viscera contained 0.50 percent salt, whereas the material removed from pilchard viscera averaged 1.51 percent salt. These amounts of salt did not greatly influence the salt content of meal made from whole pilchards.

8.42 COMPARATIVE BIOCHEMICAL STUDIES ON AQUATIC ANIMALS II. PHOSPHORUS TURNOVER IN FRESHWATER FISH AND SHELLFISH

Asano, Motokazu and Ito, Masao (Tohoku Univ., Sendai)
Tohoku J. Agr. Research 7, 291-302 (1957)
Chemical Abstracts 52, 2284 (February 10, 1958)

8.51 AMINO ACID COMPOSITION OF THE PYLORIC CAECA OF SKIPJACK (KATSUWONUS VAGANS)

Kakimoto, Daiichi; Kanazawa, Akio; and Kashiwada, Ken-ichi
Bulletin of the Japanese Society of Scientific Fisheries 22, No. 10, 631-633 (1957)

Sixteen amino acids in the pyloric caeca of skipjack were determined by using microbiological methods.

8.51 SEVERAL MYOGLOBINS IN THE MUSCLES AND CRYSTALLINE MYOGLOGIN OF FISH

Rossi-Fanelli, A. and Antonini, E. (Univ. Rome)
Boll. soc. ital. bill. sper. 32, 1156-8 (1956)
Chemical Abstracts 51, 9956 (July 10, 1957)

Fish myoglobin contains 3 fractions which comprise 70, 25, and 5% of the total.

8.51 FREE α-AMINO ACID N CONTENT OF THE SKELETAL MUSCLE OF SOME MARINE FISHES AND INVERTEBRATES

Velankar, N. K. and Govindan, T. K. (Central Marine Fisheries Research Sta., Mandapam Camp)
Current Sci. (India) 26, 285-6 (1957)
Chemical Abstracts 52, 4871 (March 25, 1958)

8.59 SEASONAL VARIATION IN CHOLINESTERASE ACTIVITY OF STRIATED MUSCLE OF THE TENCH

Siou, Gilbert (Sorbonne, Paris)
Compt. rend. soc. biol. 151, 464-7 (1957)
Chemical Abstracts 52, 3177 (February 25, 1958)

8.59 PHOTOSENSITIVE PIGMENTS IN THE RETINAS OF DEEP-SEA FISH

Denton, E. J. and Warren, F. J. (Plymouth Lab., Plymouth, England)
J. Marine Biol. Assoc. United Kingdom 36, 651-62 (1957)
Chemical Abstracts 52, 4872 (March 25, 1958)

Intact retinas dissected from dark-adapted eyes of deep-sea fish caught at depths of 200 to 2000 meters contained a golden photosensitive pigment chrysopsin which gave absorption curves similar to that for rhodopsin.

8.59 ISOLATION OF PUTRESCINE FROM FIN OF DRIED SQUID

Humoto, Yoshiyasu
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 3, 173 (1957) (English synopsis and tables)

A base was isolated from fin of dried squid (Ommastrephes sloani pacificus) as a picrate, which was found to be putrescine dipicrate on analysis. The yield of picrate was 0.4 g. from 100 g. of the starting material.

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